Academic Concept Mapping (ACM): a critical thinking tool in academic advising for improving academic performance in college freshmen

Dorothy Burton Nelson
Louisiana State University and Agricultural and Mechanical College, dburto4@lsu.edu

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ACADEMIC CONCEPT MAPPING (ACM):
A CRITICAL THINKING TOOL IN ACADEMIC ADVISING FOR IMPROVING
ACADEMIC PERFORMANCE IN COLLEGE FRESHMEN

A Dissertation
submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy
in
School of Human Resources Education and Workforce Development

by
Dorothy Burton Nelson
B.A. Southeastern Louisiana University, 1978
M.Ed. Southeastern Louisiana University, 1991
August 2007
DEDICATION

This dissertation is dedicated to my family who has allowed me to take precious time away from them to sit at the computer and write. Edward, you have been a key source of logic and sound reasoning. Your tough questions and prodding along the way made me think more clearly about my research objectives from a broader perspective. Your patience with my long hours of reading and studying, along with your companionship on I-12, were over and above what anybody would expect. Thank you for that. Colleen, I can’t tell you how much you helped me to understand my very first statistics course as I struggled to understand the Greek symbols and the statistical jargon. You were an invaluable resource for me. Brittney, I know that you would have loved to have me spend those hours with you and the girls instead of spending time with stat books (and stat conversations), but you maintained a sense of humor and encouraged me along the way. I owe you lots of visits. Jeffrey and John, you are such gentlemen and loving sons. Thank you for meeting me with welcoming smiles on days that I drove to LSU. I know that both of you are studying every bit as hard as I did, which helped you personally understand the demands on my time. Visits and phone calls were brief but always so pleasant. For me, doctoral work has been a long, encompassing, and invaluable journey; one requiring constant attention. Because you’ve been a patient and supportive family, I can proudly call myself “doctor.”
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ABSTRACT

The purpose of this study was to explore the affects of an academic advising system, the Academic Concept Mapping (ACM) instrument, on academic performance of first-semester freshmen enrolled in a four year public university in the South, during fall 2006. The California Critical Thinking Disposition Inventory (CCTDI®), a Likert-type instrument, was administered to 258 students enrolled in 12 sections (six treatment, six control) of a freshman seminar class to determine if ACM participation made a difference in scores by group type. As an additional measure, an ACM quiz was administered to all students in the ACM study. Three instructors participated, following a model much like the Solomon 4-group design, each having two treatment and two control group sections. Class sections were randomly assigned to the instructors after students registered, and were then randomly assigned a group type.

The study sample approximated the overall composition of entering freshman, with a slightly higher proportion of black students in the sample. The sample consisted of more females than males, more white students than minorities, ACT composites around 20, and hours enrolled around 14. Students were of traditional age, most working part-time, most living at home or on-campus, spent little time reading, socialized most nights of the week, watched television approximately two hours each day, worried about bills, and rated their study skills as good or needing improvement. Primary college funding was from external sources rather than from parents or from self.

ACM participation was significantly associated with semester grade point average, progression, and persistence. Students in the treatment group had higher ACM quiz scores, earned higher grade point averages, completed more of their classes, and persisted at a higher rate. ACM study participation, ACM quiz scores, ACT composite, gender, worry about bills, and
reading were included in multiple regression analysis, explaining a little over 35% of the variance in semester grade point average. ACM quiz scores, ACT composite, and gender accounted for approximately 11% of the variability in the percentage of semester hours successfully completed, and ACM study participation was the sole predictor of persistence in the university (roughly 6%) using a logistic regression model.
CHAPTER 1
INTRODUCTION

Rationale

Only slightly more than half of university students in the United States persist through graduation, according to the latest statistics compiled by the ACT (ACT Newsroom, 2004), and about a third drop out before their second year. Facing those odds makes the notion of completing a college degree grim for the most college-prepared student and an accountability challenge for institutions of higher learning. The amount of money expended for each semester mounts, often becoming a staggering debt for students and their families, and with only about a 50-50 chance of completing a degree, accountability issues must arise. Hersh, of the Council for Aid to Education (CAE), stated that universities must improve educational quality while providing greater access to students seeking a college degree (CBS News, 2001). Access alone, with no measures in place for graduation checkpoints (i.e., the classroom environment, clarified learning outcomes and benchmarks, student investment in learning, student connection to the university culture, university commitment to student experience, etc.) presents a facade of opportunity, at a phenomenal cost.

Long, a Harvard University economist, estimated that student financial aid, both state and federal grants and loans, totaled over $68 billion during the 1999-2000 academic year (CBS News, 2001). Getting a college education is expensive, but not nearly as costly as not getting a college education. According to a new study on the value of a college education for Georgia graduates (Board of Regents of the University System of Georgia, 2003), lifetime earnings resulting from a college degree will exceed the non-degree counterpart by over $1 million. In addition, graduates between 1993 and 1997 positively impacted the state’s economic profile by
more than $1 million per year. Drummond, a professor at Georgia Tech, and co-researcher with Youtie, from Georgia Tech’s Economic Development Institute, claimed that Georgia and many other states experiencing rapid economic growth owe a major proportion of the credit to college graduates (Board of Regents of the University System of Georgia, 2003).

There are numerous benefits in completing a college education for the student, the institution and society as a whole. For the individual, a college degree can lead to higher paying jobs and better chances for advancement than does a high school diploma. According to the New Millennium Project on Higher Education Costs, Pricing and Productivity (1998), college graduates, on average, earn 73% more than do high school graduates. Information released by the U.S. Census Bureau (2005), delineated the economic benefit of postsecondary education after one year of coursework (6% increase in earnings), completion of an associate’s degree (16% increase), a bachelor’s degree (34% increase), a master’s degree (40% increase), and a professional degree increases earning power by 51%. The latest information released by the U.S. Census Bureau (2005), made an even stronger case for the economic benefit of postsecondary education. Workers with a bachelor’s degree earn an average of $51,206 a year while those with a high school diploma earn $23,915. The difference over a lifetime amounts to about $1.6 million (Hansen 2005). Workers without a high school diploma only averaged $18,734 while those with an advanced degree averaged $74,602 (U.S. Census Bureau 2005). In addition, the college degree often confers other benefits such as better working conditions, more comprehensive medical insurance and retirement benefits, and intangibles such as increased self-worth, appreciation for the arts, and more intellectual social interactions (Hanson, 2005).

For the institution, each student enrolled results in more money from tuition and fees and, in the case of a public college or university, increased state funding. Formula-based state
funding often uses student counts and student credit hours (SCH) as the primary means for calculating the public funds for each college. In addition, more state education boards are now using graduation rates for at least part of the funding formula (Reisberg, 1999).

The retention of students has become a top priority for many universities, and for good reason. According to several studies (Astin, 1975; Kramer, 1982; Noel, Levitz, & Saluri, 1985), the cost to the University of losing a student can be quite high, especially if the student drops out as a freshman, as that will affect funding for the next three years. With more intense competition for new college freshmen, it makes sense to keep the students already enrolled. In fact, according to a cost-benefit analysis, the cost of recruiting one new student can be 3-5 times the cost of retention initiatives for keeping a student (Noel, Levitz, & Saluri, 1985; Tinto, 1975).

For society as a whole, having an educated population proves to be the most important factor in the quality of life in that society. The available tax base, crime rates, economic stability and growth are all greatly affected by the education level of the populous (New Millennium Project on Higher Education Costs, Pricing and Productivity 1998; Hansen, 2005).

Despite the economic importance of a college degree, in the United States, approximately 50% of new students entering college will not obtain a degree (ACT Newsroom, 2004). The largest numbers of students who drop out do so at the end of their freshman year (Consortium for Student Retention Data Exchange, 1999). Nationwide, only 74% of students return for their second year of college according to statistics collected by the American College Testing Center (Habley, 2003). Some college is better than none, but a four-year degree makes the most dramatic difference. For each year of college attended, the rate of return on investment is estimated to be 10% to 11% (Capelli & Iannozzi, 1993), but the return rate on a degree is 73%.
Numerous factors influence the success of students in higher education. Tinto (1975; 1993; 2002) studied attrition and retention factors, concluding that there are both institutional and personal factors involved. The student’s personal life presents elusive challenges in institutional efforts, as the experiences have more to do with separation issues and family influences than university provisions, thus allowing for limited, if any, institutional control. However, Tinto identified four areas or conditions over which the institution exerts control.

The first area over which the university can become programmatically involved is the student’s adjustment to college. Early college experiences dramatically impact a student’s level of confidence and persistence in the new environment. Student levels of adjustment and coping skills become related to student satisfaction. Lower student satisfaction means greater withdrawal and attrition. Many colleges are experimenting with programs such as “freshman year experience” and “extended orientation” to directly address the transition into college. The planned strategy of addressing transition issues is considered to be “intrusive” or “developmental” advising efforts. It is not left to chance that a student will seek help in a timely manner. According to advising experts, intrusive advising has a positive impact on first-year adjustment (Earl, 1988; Glennen & Baxley, 1985; Habley & Morales, 1998; Ryan, 2000; Vowell & Karst, 1987).

The second area Tinto identified as a university’s responsibility is the student’s level of college preparedness and his/her ability to meet academic standards. Targeting under-preparedness involves tutoring, academic advising and counseling, supplemental instruction, study groups, etc. Learning itself influences retention. The more students learn the more they enjoy the learning experience. Retention, under broad analysis, ultimately depends on student learning (Tinto, 2002).
Incongruence was deemed the third condition leading to attrition, and one which is key to retention, thus demanding of university attention. Tinto (1993) defined incongruence as an unsuitable match between the student and the university. For instance, many students seek autonomy, while others need immediate assistance and support (Tinto, 1993). Recruiting efforts should be geared towards recruiting and/or selecting those students who match the institution’s desired profile. This works best for selective private institutions, but is harder to accomplish at open-enrollment universities. Once the student is enrolled in the university, it is imperative that selection of a major matches his or her abilities and interests. Career exploration, life planning and academic advising, integrated and interdependent activities, focus on identifying the student’s dynamics and assisting the student with the process of systematic and rational decision-making (Damminger, 2001; Gordon & Habley, 2000).

Tinto’s fourth area or condition that can lead to dropping out is isolation. University involvement in this area is crucial. He stressed the importance of student involvement and engagement as a condition for student retention. Many studies have shown that the more involved the student is in academic and campus activities and organizations, the more likely they are to graduate. Other studies have shown the relationship between the student making a personal connection with just one faculty or staff member on campus and continuation in the university (Astin, 1993; Crocket, 1978; Gardner & Kramer, 1983; Noel, 1985; Rendon, 1995; Tinto, 1987).

Tinto (1993) also cited institutional commitment, by student and by university, as critical in retention. Commitment means the university is willing to invest the money and resources needed to ensure that students persist and succeed. This in turn defines expectations of student behaviors held by the institution. How institutional personnel express expectations of students
determines, in large part, the student’s response and commitment to the academic environment. Institutional identification of student learning outcomes, establishing quality programs, and incorporating appropriate measurement instruments serve to prevent students’ low involvement in their own learning experiences (Kuh, 1997). Setting high standards in student expectations and providing resources for meeting those standards communicates value and quality. Challenging students intellectually communicates that the university commits to helping students prepare for their future careers. Personalizing commitment to each student requires rigorous and relentless programming. One population of students may require less energy than another, or may be less vocal about unmet needs. Regardless of the population(s) targeted through institutional efforts, the construed messages remain central. Students perceive the level of expectations and interpret their value to the university (Tinto, 2002).

The socioeconomic status of the family, whether or not the parents have attended college, largely determines the likelihood of a student’s continuation in the university. Conklin & Dailey (1981) found a strong positive relationship between high school students’ college planning activities and their parent’s income. Students from higher earning families are more likely to live away from home, select schools that are more expensive, and worry less about the financial logistics. Most students (approximately 90%), by the time they reach their junior year in high school are aware of the high college costs and can somewhat accurately determine whether or not they can or should pursue a college education (Hossler, Schmit, & Vesper, 1999). When students are in the college environment and they experience financial struggles, the tendency to persist lessens. With the increase in students applying for and receiving financial aid for college costs, parental monetary input has decreased. The financial aid support covers the direct costs, while leaving extras and spending money to the families. Parents who do not provide for
indirect expenses increase the likelihood of the student’s dropping-out for financial reasons (needing to work). There is an increase in the percentage of working college students (80%), with parental expectations and necessity the contributing factors (U. S. Department of Education, 1998). A negative relationship exists between the number of hours worked per week and college persistence, with students who work in excess of 15 hours a week less likely to persist. Students employed at more than 25 hours per week are more likely to drop out of college due to financial obligations and to lack of engagement with the college community (Tinto, 2002). Tuttle, McKinley and Rago (2005) emphasized that universities must find a way to deal with the new financial situation students face. They stated that “It is a complex calculus of work+borrowing+working full or part time+attending full time or part time and compensating for the work penalty . . . and there is little in the life of the young adult to prepare him or her for this kind of cost-benefit analysis.” (p. 8).

Retention efforts include providing academic advising for students, which requires university investments of time and money, and, in contrast to the classroom environment, individual student focus. In previous studies on the effectiveness of academic advising, it was found to have a significant correlation with the retention of students. It is believed (though not directly proven through empirical data) to have a positive impact on identifying early concerns and adopting effective interventions, which directly promote student progression and persistence (Crocket, 1978; Earl, 1988; Frost, 1993; Gardner & Kramer, 1983; Habley, 2000; Kramer, 1995; Noel, 1985). There is a well-defined relationship between the student’s level of satisfaction with the institution they are attending and his/her persistence (Low, 2000). Even though there is a beneficial relationship between advising and retention, advising has been one of the least satisfying areas of the college experience, according to several major studies on student
satisfaction (Habley, 2000). In one study, academic advising ranked 25\textsuperscript{th} out of 27 services surveyed (Astin, 1993), and only 40\% of the surveyed students were “satisfied” or “very satisfied” with their college advising. ACT data indicated similar results (ACT 2002).

However, even though the advising/retention association has been shown to exist, institutions, and/or programs within institutions, are only recently (due to fiscal considerations) taking note and focusing efforts on effective advising models; and few have established uniform, structured advising practices (Frost, 1995). The process and content of advising sessions remain difficult to standardize or measure for effectiveness (other than student opinion). ACT National Student Satisfaction Survey on academic advising reports that, on average, college students meet with an advisor once, or never, each semester, for 20 minutes or less, most often targeting course approval, with the average satisfaction score less than 3, on a 5-point scale (ACT 2002).

Academic Concept Mapping, an academic advising instrument, designed by this investigator over the last five years, was created for the sole purpose for providing a structure and format for promoting comprehensive discussions between advisor and advisee. The instrument maintains a student-centered approach and provides uniformity in academic advising. The Academic Concept Mapping instrument is one advising system, based on expert-reported constructs impacting student persistence that seems to have much potential for improving student retention. Some of the characteristics of the system that make it potentially effective include:

- It serves as a visual/graphical tool (concept map) for integrating personal, social, academic, vocational and financial considerations in curriculum decisions.
- It involves a spectrum of critical thinking skills necessary for making sound, rational choices.
- It envelops the student’s interests, abilities and values.
• It becomes a point of reference for academic and non-academic decisions across time.

• It serves as a forecasting tool, improving planning efforts.

• It expedites the student’s awareness for career planning.

• It serves as a focal point for continued communication between advisor and advisee.

• It promotes greater structure in the advising process.

The Academic Concept Mapping (ACM) instrument involves a step-by-step process that promotes uniformity of delivery. This allows for greater accuracy in assessing the effectiveness of the system. Trained advisors have a framework of constructs to address with each advisee, making sure that a student’s personal, educational, and financial concerns are integrated into the curriculum plan. The ACM instrument promotes collaborative work between the advisor and advisee, requiring time for collecting information, discussion, and entering data (concepts) in the various nodes of the map. The instrument targets multiple dimensions, incorporates “if/then” scenarios, is driven by the student’s profile, and serves as a point of reference at the end of each semester. ACM has similarities to a degree audit, but is more than a check list for curriculum completion. In the past, ACM has been used effectively as an advising tool in working with junior and senior probationary students at a four-year comprehensive university in the South. Academic performance and progression, for that population, improved significantly in comparison to previous semesters, and was higher than that of a cohort group. From fall 2000 through fall 2006, students who used the ACM instrument initiated contact with the advisor an average of twice a semester for the purpose of reviewing the map and adapting current positions. This investigator believes that 1) the ACM instrument will increase student awareness, during
the freshman year, of cause and effect in academic planning and will 2) decrease the rate of freshman-to-sophomore attrition for those receiving this method of advising. To date, no other advising instrument of this type has been located, nor have data been published on this advising strategy.

**Statement of the Problem**

The primary purpose of this study is to compare the impact of the Academic Concept Mapping instrument and the traditional academic advising system on students’ continuing enrollment and academic performance at a comprehensive four-year university located in the Southern portion of the United States.

**Research Questions**

This study was designed to answer the following four questions and to meet the five study objectives:

RQ1: Will freshman students at a four-year comprehensive university in the South, who participate in the ACM instrument, achieve higher grade point averages at the end of the first semester than the grade point averages of those who receive traditional advising, as delivered in a Freshman Seminar course?

RQ2: To what degree will the ACM instrument affect the persistence of freshman students at a four-year comprehensive university in the South, in comparison to those who receive traditional advising, as delivered in a Freshman Seminar course?

RQ3: To what degree will the ACM instrument affect the progression of freshman students at a four-year comprehensive university in the South, in comparison to those who receive traditional advising, as delivered in a freshman seminar course?
RQ4: Will freshman students at a four-year comprehensive university in the South, who participate in the ACM instrument, develop and more effectively implement critical thinking skills into their academic planning, while enrolled in a freshman seminar course?

**Research Objectives**

1. To describe the students enrolled in the selected freshman seminar course sections on age, gender, ethnicity, and by educational, personal, and financial persistence factors, of undergraduate students enrolled in a four-year public university in the South by whether or not they participated in the ACM academic advising system.

2. To compare the propensity for incorporating critical thinking skills, as measured by the California Critical Thinking Disposition Inventory (CCTDI®), and the ability to apply critical thinking skills, as measured by the ACM quiz, among undergraduate students enrolled in a four-year public university in the South by whether or not they participated in the ACM academic advising system.

3. To determine the correct model fit for explaining a significant proportion of the variance in students’ academic achievement, as measured by semester grade point average, by selected persistence factors and by whether or not they participated in the ACM academic advising system, of undergraduate students enrolled in a four-year public university in the South.

4. To determine the correct model fit to explain a significant proportion of the variance in student progression, as measured by the percentage of scheduled courses completed, by selected persistence factors and by whether or not they participated in the ACM academic
advising system, of undergraduate students enrolled in a four-year public university in the South.

5. To determine the correct model fit to explain a significant proportion of the variance in student persistence as measured by whether or not the student was enrolled on the 14th class day of the semester following the semester of the investigation and by participating in early registration for the following fall semester, by selected persistence factors and by whether or not they participated in the ACM academic advising system, of undergraduate students enrolled in a four-year public university in the South.

Definition of Terms

Retention means “keeping.” For the purpose of this study, retaining the student from the freshman-to-sophomore year serves as the focal point, with the first semester considered by student development experts to be the most critical period for intrusive efforts. Universities strive to retain students from entry through graduation. Retention is usually reported by universities as fall-to-fall enrollment.

Progression is the timely completion of degree requirements, as depicted by 1) university catalog plans, and 2) by student-stated goals. Progression is measured by successfully completing the number of hours originally scheduled for any given semester, and by completing the degree in the intended time frame.

Attrition is the loss of students who, over time, were admitted, enrolled and persisted in the university past the initial 14-day class counts. Attrition numbers or percentages represent students who drop-out or stop-out of the university for a period of time. The loss of students means loss of funds.
Persistence involves student efforts as active agents on their own behalf, in identifying, addressing and overcoming the challenges presented in the university setting. Whether or not a student continues, proceeds or succeeds largely depends on the student’s internal motivation and effectiveness of coping skills. Persistence is measured by continued enrollment in the university, regardless of the progress a student makes toward graduation.

Traditional Advising, referring to historically used advising practices, more often than not, refers to advisor/advisee interaction immediately preceding registration periods. The format of traditional advising typically focuses on the immediate requests of the student, providing confirmation of selected courses for a given semester, or answering a student-generated question. In this system, students seek contact with an advisor just prior to or within registration periods for the sole purpose of getting courses approved and registration holds removed. Because of the action taking place during peak periods for student traffic, discussion is limited to course approval, and quite often, the student may not even meet with an assigned advisor. Advising support personnel (peer advisors, graduate assistants, or clerical staff) often relieve advisors and traffic congestion by providing “course confirmation” during the peak periods. Traditional advising, for purposes other than course approval, and at other than registration periods, depends upon 1) the advisor initiating contact through regular mail, e-mail, or telephone, and 2) felt need and subsequent action by the student. Traditional advising often leaves it to chance that a student will respond to contacts and will seek help in a timely manner, disclosing relevant advising concerns.

Developmental Advising connotes a student-centered philosophy. Discussion, decisions, and actions are based on student-reported concerns. Advisors, in this camp, perceive that student receptivity to information supersedes the information itself. Students determine content and pace
of advising sessions, while advisors determine need for additional meetings, based on student receptivity and information needed. Students may be asked about their personal experiences in the university setting, with affective experiences perceived as important as cognitive experiences.

**Prescriptive Advising** means that the advising options and plans are clearly developed and displayed in the college catalog. Policies, procedures, timelines, deadlines, and events of importance are the focus for advising interactions, with the advisor’s stance being the expert. The students are given the information needed, regardless of volume or receptivity, and are expected to follow advisor suggestions, recommendations, or requirements. Students’ personal experiences are not relevant to the successful completion of the prescribed curriculum and related procedures.

**Intrusive Advising** involves proactive strategies for engaging students in interactions between advisor and advisee. Contact is initiated by the advisor, with a structured purpose and plan for targeting critical issues and timelines. Intrusive meetings quite often precede important events, such as registration, application to academic programs or graduation. They may also be reactions to students’ academic performance. Freshman courses which address academic performance concerns are prototypes of intrusive advising models.

**Educational (academic) Persistence Factors** include high school grade point average, ACT or SAT scores (composites and subscores), involvement in curricular and non-curricular activities (Tinto, 1975), rigor of course loads, clarified career and academic goals (Gordon, 1995), and study habits.
Personal Persistence Factors include psychosocial factors, such as locus of control (Rotter, 1966), academic self-efficacy (Bandura, 1994), outcomes expectancy, decision-certainty, ability to “forecast,” help-seeking and receptivity to help, and comfort with familial separation.

Financial Persistence Factors include sources of funding (grant, loans, scholarships), means of additional support (family members, trusts), job situations (number of hours worked, newness, flexibility of work hours, location, commute time), and financial responsibility (bills, dependents).

Concept Mapping is a nonlinear, graphic representation of unstable domains, depicting major concept nodes and the interrelationships of those nodes. It is a learning strategy identified as having a significant impact on retention and retrieval of information, with continued processing of data over time. A concept map can be expert-generated or reader-generated, but with greater impact due to collaborative efforts between the two. For instance, if the expert begins the map by providing the “thought starters”, then the reader (or student) can complete the map with greater understanding and ease of navigation.

Academic Concept Mapping instrument is a three-page, multidimensional visual/graphical representation, depicting the student’s integrated responses and choices across educational, financial, and personal domains. It is a specific type of concept map, allowing the student to assimilate personal dynamics and immediate behaviors, determining implications for long-range planning. The last page of the ACM instrument serves as a reference point at the close of each period or semester for assessing academic performance in meeting the students stated goals. When goals are not met, the instrument requires updating to accommodate skews from the projected plan. Advisors must be trained in the process and follow-up of using the instrument. The ACM requires at least one hour for the first session of use, with length of
follow-up visits dependent on student dynamics during the semester (grade point average, course withdrawal, change of major, hours worked at a job, family influences and concerns, a major’s entry requirements, and other advising issues that arise) and purpose of visit. The process of using the ACM instrument can be used in a classroom environment or in a one-to-one advising session.

Critical Thinking is a set of skills necessary for processing complex information that is both personally and socially significant. The abilities to deduce, induce, analyze, infer and evaluate aid in conceptual synthesis across any life domain.

Critical Thinking Disposition is the tendency to consistently and willingly incorporate critical thinking skills into life situations. The need to know, the willingness to accept divergent view points, the acceptance of multiple possibilities and the discomfort that may result from temporary postponement and the vigilance in observation provide a natural conduit for implementing critical thinking skills. CT skills can be taught; CT disposition is an attitude about the process of critical thinking and the willingness to use the skills.

Significance of the Study

Improving academic advising practices will contribute to greater advisor and advisee interaction, and will positively influence student persistence in the university. When students experience meaningful educational interactions and intellectual challenges, potential for graduation and suitable employment increases. The end goal of the university’s business is to educate and graduate qualified individuals for entering and contributing to the economic development of surrounding communities and beyond. The ACM instrument, a system with a specific set of constructs integrated into a concept map, targets issues reported to be of greatest concern for first-year students. The first-year experiences determine staying or leaving.
Studying the effectiveness of using the ACM instrument with first-year students can only enhance current practices and broaden the body of knowledge. If first-year freshmen interact with a trained advisor, using the Academic Concept Mapping instrument of advising, addressing important constructs across personal, educational and financial domains, students will identify and address major issues of concern. Addressing the issues through a visual concept mapping procedure will provide a basis for continued contact and discussions; an important dynamic for student persistence in the university. The benefits of this study are that 1) students will persist at a higher rate as a result of experiencing advisor/advisee interactions using the Academic Concept Mapping instrument, 2) students will make timely and strategic academic decisions, based on using the ACM instrument, that will ultimately result in higher levels of academic performance in comparison to students who do not receive the same type of advising, and 3) student satisfaction with the advising process will increase due to the highly personal and student-centered nature of the instrument.

**Limitation of the Study**

On the persistence factors questionnaire, students were asked to report the number of hours they spent watching television on a daily basis. The responses ranged from zero to 10, with one or two hours the most frequent response given (average was 2.76, with a positive skew of 1.249 and had a leptokurtotic value of 1.658). The distribution suggested that a high percentage of the students did not take into account the hours using the television for activities other than viewing a transmitted program. The item did specifically request the response to include the number of hours spent using the television as or another monitor for playing video games or internet use. The San Diego Union-Tribune (2007) reported on a world-wide survey of hours spent per week in watching television and listening to the radio. People in the United
States watched an average of 19 hours of TV per week, and listened to the radio 10.2 hours each week (possibly simultaneously); and that estimate was modest, as the report did not include other electronic devices. According to O’Toole (2000), in reporting survey results conducted by the Stanford Institute for the Quantitative Study of Society, heavy internet use (10 or more hours per week) comprises approximately 14% of all internet users. Usage was not reported by specific populations, but did report that older Americans were not among the heaviest internet users. Korgen et al., (2001) studied internet use by students and found that the average number of hours spent using the internet on a weekly basis was between 3.8 and 8.4 (ethnicity dependent) and use was highest among college freshmen. It was found that internet use and the number of hours spent studying had a significant and positive association. Another study by CNN (2006), reported an average of 6.5 hours daily using a combination of electronic media (television, internet use, video games, DVD’s, ipods, MP3 players) for ages 8-18, often involved with more than one type at a time. The age range includes the majority of college freshman and concurs with the profiles which indicate heavy daily use of electronic activities that may affect (positively or negatively) academic pursuits.

Because of the range of responses and the symmetry of the distribution, this researcher determined that the wording of the questionnaire item was inadequate for obtaining necessary information in consideration of academic outcomes

Another limitation for the study was noted after considering the range of responses in questionnaire items that requested information about time frames; different time frames were elicited, such as minutes, daily, or weekly. Two items of greatest concern were the number of daily hours for television viewing and the number of weekly hours spent reading. The item wording may have been overlooked by the students, which could account for the extremes in
answers. The students may have responded to hours per day when thinking about hours per week, and vice versa. The questionnaire item time frame was selected by the researcher based on assumptions or beliefs about student behaviors. For example, because of the assumed high frequency behavior of college students in watching television and using other associated electronics, it seemed simpler to ask for the number of daily hours of use, rather than weekly. The opposite was true in the assumption held for hours spent reading. That opinion was supported by the world-wide study reported in the San Diego Union-Tribune (2007) with compared the number of hours spent reading by students in various countries. Only the countries listed as the top 16 had weekly hours reading reported. The country rated 16th reported 6.3 hours per week, and the United States was not on the list at all, meaning that the U.S. averaged less than 6.3 hours a week spent reading (<1.0 hour per day). Students who responded that they read less than 1 hour per week may have meant daily hours.

Both questionnaire items are a concern due to the wording. The reader is cautioned when considering the importance of those two variables in the analysis of this study and should address the wording or format of the item for inclusion on surveys for future studies.
CHAPTER 2

REVIEW OF THE LITERATURE

Retention

Recruiting new students into a university requires one type of strategy; retaining the existing students requires another, but attention on congruence between the two types of strategies could provide a shortcut to overall improvement in long-term retention and graduation rates. According to a 1994 study conducted by Astin, two-thirds of the variation in graduation rates in higher education was attributed more to the profiles of entering students than to the quality and effectiveness of university retention programs (Higher Education Research Institute, 2003). Recruiting students and making a good fit, according to the 1994 Astin study, based on findings correlating student retention and the Cooperative Institutional Research Program (CIRP) survey, promises greater return for retention efforts (Higher Education Research Institute, 2003). Tinto (1987) urged studies to focus on the entering student profiles, the role, scope and mission of the institution, and specific stages in student experiences for determining strategies to improve both recruitment and retention efforts. Recruiting students is a costly “romancing” tool. The ability to retain students makes a much broader statement of the overall quality of the institution is commitment to the student. Research reveals that problems with attrition (weakening of students’ continuation in an institution and subsequent departure) are found to be greatest during the freshman year of college (approximately 40% attrition rate nationally) (Glennen, 1995), with 50% of dropping out occurring during the first six weeks of the freshman year. When universities recruit, make promises (direct or indirect), but don’t deliver, many students experience the mal-fit and depart (Tinto, 1987).
Retention programs aimed at engaging students in the university culture have grown over the last few years, with numerous studies conducted, measuring program effectiveness. The scope of retention programs spans career planning, academic support, freshmen success courses, and campus connections (Nutt, 2004). A key support program identified through many studies that is most notably correlated with retention outcomes is academic advising (Gardner, 1995; Glennen & Vowell, 1995; Habley, 1993; Kramer, Chynoweth, Jensen, & Taylor, 1987). Program effectiveness depends on the vested interest of the personnel involved. Within the scope of academic advising, advisors (faculty and professional) should understand the early challenges for students and remain alert for the warning signs (absenteeism, withdrawal, low grades) of academic deterioration (Elkins, Braxton & James, 2000).

**Retention and Persistence Factors**

Tinto’s theory of student engagement explains the three stages of student involvement, needing appropriate resolution for persistence through graduation. First, a student must complete the often troubling stage of separating from the previous community (family, friends, and community involvements). The level of previous commitment held by the student impacts the ease of transiting to commitment to the university culture (Elkins, Braxton & James, 2000). The transition requires, to varying degrees, the rejection of attitudes and values held by the former culture; a period of time that can be uncomfortable to the point of leaving. The support of parents, friends, and significant others, during the critical transition period (giving approval and freedom to change cultural beliefs), strongly correlates with student persistence (Elkins et al., 2000). The first-year experiences and successfully resolving separation issues provides the foundation for successful resolution of later student concerns (Tinto 1987).
Nutt (2004), described several types of programs targeting retention, including career planning, academic support programs (Learning Communities, Freshmen Seminar and Orientation courses, tutoring, skills workshops, etc.), but stressed that academic advising serves as an ongoing program that tailors a student’s academic program to his/her unique goals. Cuseo (2003) claimed that a student’s ability to make a commitment to life goals, program goals, a college major, etc., is the most important factor in student persistence. He stated that three out of four students entering the university have no clear career/occupational goals, and only 8% of declared students have an understanding of their majors. Nutt (2004) stated that advising is a form of teaching, and that all effective teaching (thus advising) begins with the identification of student learning outcomes. Helping a student clarify and set goals, then, becomes a paramount task for academic advising. Questions such as “What do we want students to know, do, and value, and by when?” drive the parameters and directions of effective advising programs. Maki (2004) defined student learning as:

a process of constructing meaning, framing issues, drawing on strategies and abilities honed over time, reconceptualizing, understanding, repositioning oneself in relation to a problem or issue, and connecting thinking and knowing to action (p.2)

Cuseo (2003) stated that enhanced academic advising should enhance student persistence (and retention), but a mere acceptance of that postulate is not enough. He stressed that a definition of enhanced advising and enhanced student persistence must precede the actions; otherwise, we may not recognize the outcomes. Defining what is important, what is expected, and what it looks like increases the likelihood that it will occur. What is expected refers to the clearly defined parameters of student learning outcomes.
Students who seek, receive, and practice skills gained through academic support programs, including academic advising, show increased levels of academic performance and academic self-efficacy; increased self-efficacy (perception of ability to control and impact one’s own involvements) positively correlates with a student’s academic persistence and success (Cuseo, 2003). Tracking data indicates that support programs are highly under-utilized by college students; a disturbing fact when considering potential benefits for student persistence and retention. First-year students, especially certain minority groups and underprepared students, may be reluctant to ask for help, indicating that the responsibility during this stage may necessarily rest with the institution (Tinto, 1987). Intrusive efforts with first-year students may be the only way to guide students through the challenges, mentoring how to become self-efficient and an interdependent within the university culture (Cuseo, 2003; Elkins, Braxton & James, 2000).

**Advising as a Retention Tool**

Advising, simply stated, is a somewhat defined set of strategic conversations between an informed, caring advisor and a student, who will be impacted by the university setting. Concerns of the scope and timing of the conversations, and the degree of impact on a student’s continuation in the university, require greater attention. Advising is a personal experience. Academic programs are impersonal. The advising process serves as the primary avenue for personalizing the academic program, providing for a new plan, and, possibly, a more relaxed acceptance of progression and retention (Glennen & Vowell, 1995). A number of studies have shown that quality academic advising programs are the key to retaining first-year college students. Habley (1993) found that only 60% of institutions had a written policy statement on academic advising, and significant numbers of those did not include goals, objectives, or
techniques for evaluating effectiveness of programs. Administrative involvement in establishing the guidelines and determining the mission of academic advising instills the purpose and importance of the program campus-wide. A general mission statement for academic advising would be to assist students in developing meaningful educational goals, compatible with life goals. It should also delineate the expectations of the program, advisors and advisees.

Ironically, in times of budget cut-backs or constraints, advising programs are often the first targeted because they may not be seen as central to the instructional mission of the university. Glennen, Farren and Vowell (1996), studied the effectiveness of quality advising for first-year students and stated that upon fiscal review, student advising centers improve fiscal stability by increasing retention and graduation rates (when based on an enrollment-driven formula). Many universities have awakened to the idea that academic advising and student retention are indeed critically linked and have allotted adequate time and resources to program development. For example, the Texas Academic Skills Council’s Committee on Advisement and Placement recommended to the Texas Higher Education Coordinating Board that, based on a statewide study of both public and private colleges and universities, academic advising should be mandatory, comprehensive, rewarded, and continually evaluated. Blended, those qualities would culminate in a substantial financial and community investment for the institutions (1989).

**Scope of Academic Advising**

According to Gardner, Director of the National Resource Center for the Freshman Year Experience and Students in Transition, and Kerr, past President of the National Academic Advising Association, there is no mission more vital to the success of higher education than its efforts to ensure the initial success of beginning freshmen students. There is a wealth of
important empirically based research correlating quality academic advisement, student satisfaction, and enhanced persistence and graduation (Gardner, 1995).

Content of advising sessions is multifaceted with two primary dimensions for concentration: 1) educational/academic planning, and 2) career/life planning. Students often lack awareness of the relevance and impact of college decisions on their futures. Guiding students through the decision-making process requires skillful interviewing and questioning on the advisor’s part. Individualized, developmental advising is often diminished due to time constraints and lack of knowledge of underlying theory; thus, course scheduling becomes the hallmark of the advising session. To increase opportunities for quality advising, course scheduling and associated information may be delivered in group settings in the days prior to registration activity, reserving individual sessions for addressing and integrating broader student concerns.

Seven standard university advising models were identified by Habley and McCauley, (1987). Each model has intrinsic strengths and weaknesses, but the ideal environment for any college or university would involve shared responsibility of information delivery by faculty, professional advisors, peer mentors and trained paraprofessionals (Frost, 1991). Needs and concerns of first-year students (i.e., anxiety about fulfilling expectations of peers and faculty, exposure to new cultures, family concerns, breaking away from the familiar, attachment to a new set of norms, uncertainty about major and career decisions, incompatibility, academic underpreparedness, increased social distractions, and inability to manage time and money) require a cooperative effort by key contact persons.

The Council for the Advancement of Standards (1986) included the following institutional goals for academic advising:
• Clarification of life goals
• Development of educational plans
• Selection of appropriate courses and other educational experiences
• Interpretation of institutional requirements
• Increasing student awareness of educational resources available
• Evaluation of student progress toward established goals
• Development of rational, systematic decision-making skills
• Referral to and use of other institutional and community support services, where appropriate
• Collecting and distributing student data regarding student needs, preferences, and performance for use in institutional policy-making

Some environmental factors demanding quality academic advising are 1) changing student demographics, 2) external pressures on a student’s choice of major, 3) cost/time pressures for degree completion, 4) curricular complexity, 5) rising cost of attrition, and 6) unfavorable publicity for institutions (Marchese, 1987).

**Information Management for the First-Year Student**

Currently, the most effective academic advising includes comprehensive, timely, and accurate information. Kramer, Chynoweth, Jensen, and Taylor (1987) provided an explanation of what a comprehensive academic advising program should target with the beginning student population.

Prior to semester onset, students should:

• Prepare for entry into an academic major discipline
• Become familiar with college requirements, course contents, and terminology (i.e., credit hours, sections, building abbreviations, etc.)

• Complete initial registration

• Learn how to adjust class schedule before semester begins

• Learn about financial aid options and policies for acquiring and maintaining financial aid

The first year, students should:

• Learn how to adjust class schedule after semester onset

• Understand university and major requirements (Basic curriculum, credit hours, residence, major courses, prerequisites for admissions to college or major)

• Understand university policies and academic options (academic warning and probation, changing majors, challenging classes, advanced placement credit, transfer credit, independent study credit, study abroad, honors courses)

• Develop accurate expectations of time and effort required to make successful academic progress (time management, study skills and habits)

• Evaluate whether major and career choices match interests and abilities (identify interests, assess abilities, explore major/career options)

• Assume responsibility for educational program

• Learn how to associate with instructors and professors in and out of class

(Kramer, Chynoweth, Jensen, & Taylor, 1987)

**Advising Exploratory Freshman Students**

The first year of college is a time for students to explore, mature, and lay the foundation for a lifetime of making sound, rational choices. Choosing from academic and career options
requires time and resources for exploring in an orderly procedure; students must know how to manage information and to think critically about the long-term ramifications of their immediate choices. Whether a student enters college in a declared or undeclared status, the requirements for early information management are the same. Many institutions provide special advising programs for the undeclared student (Habley, 1993), but ignore the informational or exploration needs of the declared students. Gordon (1995) stated that from 20% to over 50% of entering freshman are undecided about academic majors and career choices. Crites (1969) believed that students can learn and develop career mature cognitions through direct, intrusive methods. A skilled advisor can soon detect the difference between an undeclared, exploring student and an indecisive student. (The latter needs closer guidance while sorting through the massive amount of information provided by an advisor. Indecisive students are those who have unsatisfactory thinking habits that permeate all areas of functioning. Educational and career decisions can be addressed after resolution of the faulty cognitions.) Undecidedness has several variables that determine when and how much information is needed (Fuqua, Glum, & Hartman, 1988; Lucas & Epperson, 1990; Van Matre & Cooper, 1984). These variables of student decisiveness include:

- Identity concerns
- Anxiety levels
- Self-efficacy
- Fear of commitment
- Career salience
- Sex-role orientations
- Family influences
Institutions that permit declarations of undecidedness by entering students provide some sort of professional help to facilitate making important academic and career decisions. The attitude or philosophy of the institution determines the approach to information delivery. Belief that students are totally responsible for getting what they need incorporates more passive techniques in advising approaches. Advisors who see themselves as informational resources take more initiative in student/advisor meetings, but do not necessarily initiate the contact. Belief that the student and advisor are partners for a given time in the complex exploration process results in more intrusive advising initiatives. Partnerships indicate a mutual responsibility for the student’s academic and decision-making progress. Partnerships enhance and encourage student autonomy, offering a base of stability and continuity of contact with a caring, knowledgeable advisor.

**Developmental Advising**

Advisors must be sensitive to the varying levels of these concerns within their advisees and tailor their approaches to fit the unique set of informational needs. It is imperative that advisors are knowledgeable of campus resources and intrusively connect the student to the appropriate service. Chickering and Reisser (1993) suggested that there are several developmental tasks requiring attention before making adequate career and academic choices. Satisfactory resolution of these tasks predicts increases in student persistence.

**Developmental Tasks Requiring Early Attention**

- Developing physical, emotional, social, and intellectual competence
- Assessing interests and awareness of options
- Identifying and clarifying work values
- Developing a clear sense of self in a vocational context
The kind and amount of information provided should be determined by each individual student and controlled by the advisor. Crookston and O’Banion (1972) first advocated Developmental Advising over Prescriptive Advising, describing a dynamic relationship between student and advisor. Developmental advising is a hierarchical process that recognizes difference in needs of first year versus subsequent year students. Issues addressed build a solid foundation of support for increased success (Astin, 1993; Pascarella & Terenzini, 1991; Tinto, 1993).

Prescriptive advising is a process defined in terms of general policy and procedure, delivered to all students in the same manner and at appointed times designated by the university.

Developmental advising is a process which focuses on student informational needs, which results in shared, interactive decision-making and problem-solving (Frost, 1991). Crookston & O’Banion (1972) stated that there are two broad principles of developmental advising that are indicators of the institutions accountability and effectiveness; 1) Higher education offers opportunities for individuals to plan for self-fulfilling lives, and 2) Teaching includes any experience that leads to personal growth, and can be measured and evaluated. It is the responsibility of the institution to create an environment conducive to the above principles, and can be accomplished through quality academic advising programs. Developmental advisors should be selected on the basis of their knowledge of student development and their willingness to apply developmental concepts in the advising process. Training is essential and should include information on developmental theory, processes and concepts, with described techniques on how they should be applied to advising.

Developmental Advising Continuum

- Establish a caring, working relationship
- Help students clarify goals; create a mission statement
• Discuss relevance of higher education and liberal studies
• Encourage thinking about life and career goals
• Relate interests and abilities to plans
• Assist in exploring and selecting majors and minors
• Provide rationale for requirements
• Help select and schedule courses
• Monitor academic progress
• Encourage students to explore options, become involved, and use campus resources throughout their time in college

Chickering and Reisser (1993) described Seven Vectors of Developmental advising. These vectors compliment the institution’s role, scope and mission.

Seven Vectors of Developmental Advising

• Develop competence (intellectually, physically, interpersonally)
• Manage spectrum of emotions
• Move through autonomy to interdependence
• Develop mature relationships, tolerance for differences, and capacity for intimacy
• Establish sense of identity for social, cultural and historical contexts
• Develop purpose (plans, aspirations, commitments)
• Develop integrity

Intrusive Advising

In the “ideal” environment (Habley, 1997; Noel, 1997; Tinto, 1990), academic advising initially served to connect the student with the university. This is best done through intrusive,
comprehensive activities. Glennen (1975) stated that intrusive advising efforts communicate advisor curiosity and interest in the student’s educational concerns. Institutional efforts should be proactive, rather than reactive to the student’s difficult or frustrating experiences. Intrusive activities, however, require time, expertise, and manpower from both faculty and professional advisors.

Intrusive Advising Initiatives

- Scheduling group advising sessions or workshops; advisee attendance is mandatory
- Offering a credited Freshman Seminar course in which self, academic, and occupational exploration can be guided over an extended period of time (Gordon, 1995)
- Offering a credited Freshman Seminar course in which student success correlates are directly addressed and practiced over an extended period of time (Noel & Levitz, 1998)
- Controlling amount and kind of information given for better information management
- Requiring follow-up contact for advising decisions made
- Guiding critical thinking through skillful questioning and postulating (Laff, 1994)
- Identifying problems with academic progress before the student becomes discouraged and drops out
- Providing opportunities to confirm academic/occupational interests through experiential activities (i.e., recommending academic course
work, extracurricular activities, part-time work, volunteer experiences, and informational interviews with workers in the field)

**Advising Delivery**

Delivery of information can be disseminated through individual contact, group sessions, or within the parameters of an expanded orientation or freshman seminar credit course. The quality of the information depends on the training and expertise of the advisor and the identified learning outcomes. Criteria for evaluating the advisor should include the following skills and abilities:

- Mediating between student expectations and experiences
- Orchestrating student and institutional resources
- Intervening in academic progress (active and intrusive)
- Advocating for constructive change based on observation and documentation of changing student needs and effective policies
- Balancing challenge and support (Sanford, 1967)

Whatever method of delivery the advisor chooses, incorporating peer mentors has been shown to have a positive effect on student persistence. Newcomb and Wilson (1966) stated that there is a powerful affect of peer group support on first-year students in the first six weeks of college. Feldman and Newcomb (1969) identified what they believed are the advantages of using peer mentors in an advising program.

**Peer Mentors**

- Help achieve independence from home and family
- Support institution’s academic goals
• Offer general emotional support and fulfill needs not met by curriculum, classroom or faculty
• Provide practice interacting with others of different backgrounds and experiences
• Give support in decision-making

**Advising Importance Summary**

Pre-enrollment orientation is preliminary to effective academic advising, setting the groundwork for the relationship between advisor and student. Frost (1991) stated that advising should start with an awareness of the larger purpose of advising, and then move on to awareness of the details. According to Gardner and Hansen (1993), effective orientation is the initial opportunity to develop important advisor/advisee relationships, and is critical as part of the link to academic advising, freshman seminar, and student persistence and retention.

Tailoring academic advising to meet the needs of the given student population requires several factions, campus-wide, to collaborate and design an efficient, effective program. Selecting and training all advising personnel, methods of information dissemination, and weighing the impact of the program on student satisfaction should be the focus of each delivery system.

Informational needs change for students from one year to the next, and delivery systems must manage the information in an appropriate, timely manner. Beginning students often demonstrate limited information processing and require intrusive techniques (via academic advisors) for problem avoidance. Contacting students through any means possible, requiring follow-up and “homework,” leads (by example) to increased independence and interdependence,
during the students’ stay in the institution and, after graduation, in the economic settings (a goal shared by colleges and universities).

**Concept Mapping**

Concept mapping, a nonlinear graphic presentation of a set of constructs, is a learning strategy incorporated into educational programs across disciplines (Chang, Sung & Chen, 2002). The positive outcomes of using concept mapping perpetuate probes into its dynamics. Cunningham and Stewart (2002) explained that concept mapping integrates often unstable, complex domains with interdependent relationships. Causal Influence Diagramming (CID), concept mapping, allows for the analysis of learning through the development of the diagram between expert and student. Cunningham and Stewart (2002) determined that CID positively affects student performance on traditional assessment measures.

Student learning depends on student meaning-making (Van Boxtel, 2002). Concept mapping helps students become aware of constructs, observe the relationships, and reflect understanding. In this sense, the student is empowered to take charge of their own meaning-making. Daley (2002) stated that concept mapping develops thinking skills while fostering knowledge accommodation and assimilation. According to Suzuki (1987), instructional curriculum maps effectively present interrelationships among learning objectives from various outcome domains. Concept mapping is a hierarchically arranged graphic representation of knowledge, which reflects content stored in an individual’s semantic long-term memory (Jacobs-Lawson & Hershey, 2002). Van Boxtel (2002) posited that concept mapping leads to significant learning strides, and promotes elaborative, quality discussion. Learning outcomes can be directly measured by the depth and content of the discussions. The diagrams indicate the interrelationships among the concepts, representing frameworks and parameters within a given
domain. Bedics (1984) used the term program mapping rather than concept mapping, indicating that an individual must comprehend the spectrum of activities, the goals of a program, and the interdependent relationships among the various components. He viewed program mapping as encompassing broader constructs. Individual-level learning should lead to organizational-level learning (Spicer, 1998).

Van Boxtel (2002) observed students as they participated in the development of a concept map depicting complex dynamics of electrical circuitry. He noted that students engaged in meaningful conversations, introjecting approximately three propositions per minute, with almost no off-task talk. Three related activities were observed as relevant to effective construction of the map; 1) use of prior knowledge, 2) recognition and acknowledgement of problems, and 3) meaningful relationships must be identified (Van Boxtel, 2002). Concept mapping is an open task, allowing for questioning, open negotiation, resolving disagreement, and co-constructing meaning. However, concept mapping is not without limitations. The predictive or explanatory value of the activity is often underdeveloped and found lacking. Students more clearly demonstrate understanding of interdependent relationships that exist on a continuum, but often lack ability to explain phenomena in concrete detail (Van Boxtel, 2002). Overall, the value of concept mapping lies in the intrinsic nature which leads to rich verbalization, discussion and seeking answers.

College students express discomfort with constructing concept maps, when required to generate the map with no previous format. The level of difficulty leads to cognitive overload, with learning the actual concepts and relationships secondary to constructing the concept map itself. Students need structure and guidance in diagram construction to effectively focus on developing an understanding of the major concept nodes and links between the nodes (Chang,
Sung & Chen, 2002). Graphic illustrations provided by an expert (teacher or map designer) provide a macrostructure for managing cognitive overload, but at the same time may increase student passivity. Chang et.al, (2002) studied the effects of three levels of concept mapping on groups of 5th grade students in Taiwan. The findings of the study revealed that map correction, in comparison to map generation and map completion, was significantly more effective. Map correction involved providing students with an expert constructed map, but with 40% inaccuracies. The process of identifying the inaccuracies culminated in learning outcomes significantly higher than for the cohorts. Map correction manages cognitive overload and prevents student passivity. Presenting students with a partially completed, pre-determined concept map, jointly confirming the major concept nodes, identifying the interdependencies, and discourse between student and professional (map designer), promotes clearer, more substantial understanding.

**Concept Mapping in Academic Advising**

The domains for advising first-year students, as outlined by major studies, include personal, educational and financial domains. Concepts included in each of the three domains are as follows:

**Personal** – interests, abilities, values, family influences, leisure activities, coping skills, motivation, separation and commitment issues, and connection to the university (including relationship with an advisor).

**Educational** – learning styles, choice of major, career salience, balance of class subjects, educational and occupational goals, study skills and time management, and understanding university policies, procedures and timelines.
Financial – need to work, juggling work and course schedule, obligations, available support and resources, and registration options (distance learning, off-campus courses, night courses, etc.).

Academic Concept Mapping personalizes the academic experience for first-year students. Programs of study take on new meaning through the ensuing conversations between advisor and advisee. As Glennen and Vowell (1995) stressed in their concluding editorial statements in the monograph Academic Advising as a Comprehensive Campus Process, It is far more important that the advisee evolve his or her own plan of action than it is to adopt any plan that an academic advisor attempts to impose on that individual…They (advisors) must help students set goals, examine options, choose a course of action, and evaluate the results of that choice. (p. 141)

The advising system, Academic Concept Mapping, serves as an initially intrusive instrument, as it pre-identifies student concerns, and requires at least one mandatory face-to-face visit, but also affords, to the greatest degree possible, extensive developmental advising. Student concerns, goals, and attributes sculpt the academic plan. In Academic Concept Mapping (ACM), the graphical presentation allows for the advisor to enter pre-collected data (from student questionnaire), setting the stage for the first strategic conversation. The first face-to-face meeting focusing on the map allows for meaningful, quality discussion between advisor and advisee. As the map evolves over time, student learning and understanding of the map’s forecasting nature, interrelationships among his/her personal, educational, and financial domains should become evident through systematic decision-making, student satisfaction, and academic performance.
Critical Thinking

Critical thinking involves a spectrum of reasoning skills necessary for processing complex information into its simplest and most essential elements (Gagne, 1965). It’s the process of drawing from past knowledge and experience for identifying and verifying relationships among seemingly discrete variables for developing new schemata (Piaget, 1954). Piaget defined a process of cognitive development, with the highest level defined as formal operational, involving abstract reasoning and hypothesizing. Bloom (1956) defined levels of thinking skills, from memorizing to synthesizing, and explained that true critical thinking incorporates analysis, the most advanced of the thought processes. This type of thinking involves higher-order thinking in what Bloom labeled as “intellectual behavior.” Sanchez (1993), in his article “Making Connections” stated that when an individual engages in critical thinking, knowledge becomes more meaningful and useful, knowledge is retained and retrieved much easier, and knowledge can be transferred from one situation to another more naturally. Sanchez also stated that critical thinking skills can be developed with practice and that critical thinking should be a tool used in instruction.

The basic critical thinking skills, as defined by a panel of experts in the 1999 Delphi Study, sponsored by the American Philosophical Association, are analysis, deductive and inductive reasoning, inference, and evaluating. Regardless of the terms and definitions, critical thinking involves intellectual behaviors, which can be readily observed by instructors and others. Teaching critical thinking skills through explanation, definition, or hypothetical reasoning, are effective, but none are exclusive of modeling the types of critical thinking skills necessary for solving problems. Conceptually speaking, critical thinking is essentially a tool for inquiry.
(Facione, P. et al., 1990, 1998). Asking probing questions and guiding students to do the same is a form of modeling. Ask, don’t tell.

Critical Thinking Disposition

Some students study hard, but others seem to study naturally. Some students work harder than others in their social skills, while others have a natural gift for interacting and communicating. Can these types of activities be taught? The answer is “absolutely.” We build curricula around teaching such skills. The real question is, “Can the naturalness of a skill be taught and learned?” According to Facione (2000), not only can the skills be taught, but the disposition for tolerating and incorporating such skills consistently into daily endeavors can be taught as well. Facione stated that educational programs should target the intellectual tendencies and characteristics, while simultaneously strengthening a student’s ability to think cognitively. The disposition to critically think indicates that the student naturally and consistently uses reason to make decisions and problem-solve. According to Paul (1990), the disposition toward thinking critically cannot be distinguished from the skill set; or rather than the disposition is a skill in and of itself. Facione (2000) believed that with guidance and practice, over time, the student can become more skillful and more natural in the use of the skills. This concept is likened to learning to play a musical instrument, in which practice makes perfect. Sanchez (1993) explained the cycle of learning as a three-phase system, with the first being the need to explore a problematic situation. The next phase, with satisfying information gained during the exploration phase, is conceptualization. In this phase the student defines relationships among the information, organizes it in a meaningful way that can be used for later explanation and inference. The last phase is application, in which the student can illustrate the relationships and go beyond those to both reflect and postulate or “futurize.” According to Frankl (1965), an
Existentialist and proponent of centering educational pursuits on the student’s personal “lived” experiences, the ability to think in terms of the future serves as a pivotal determinant of success or non-success. Frankl (1965) advised that holding happiness or success as a goal was futile, but that clarifying and achieving goals directed at achievement and accomplishments led to happiness and success.

**Critical Thinking and Student Persistence**

Students who are involved in the university setting, both academically and socially, persist at a higher rate (Astin, 1984). Involvement connotes action, which can be observed by others. Yu-Chen Hsu (1999) established that active learning for medical school students serves as the most effective model, internationally, for medical students to learn their trade. The term “Problem-Based Learning” (PBL) was defined by Hsu (1999) as the process of learning that results from direct involvement and working toward understanding the complexities of a problem and resolving the problem in a satisfying manner. Students who work through their own problems under the guidance of an instructor or advisor experience learning through self-efforts, which breeds self-confidence. Perry, an expert in the field of critical thinking, postulated that critical thinking is at the core of educational pursuits and central to any real learning that takes place (1970). Perry believed that the development of cognitive reasoning takes place through four stages of critical thinking, with the most sophisticated being Commitment and Constructed Knowledge (1981). For college students, and beyond, real learning takes place through critical thinking processes as consideration and tolerance of opposing views, debate, inquiry, and discourse. When incorporating critical thinking into the college student experience, both in and out of the classroom, student intellectual behaviors blossom as they learn to frame problems, reflect on personal judgment, effectively make decisions and solve problems through reasoning.
and logical thinking (Sternberg, 1985). Employers count on universities to graduate students who possess such skills, as they continue thriving in the workplace, directly adding value to the business (Hsu, 1999).

**Critical Thinking in Academic Advising**

Many universities currently offer a freshman seminar or freshman success course as a delivery mode for academic advising. Using strategies such as the Academic Concept Mapping instrument demands the use of critical thinking skills by its design. The key persistence factors and the related issues are discussed, but with students doing the active work. Students will process by identifying the problem, reflecting on past experiences, analyzing why something worked or didn’t work in the past, and projecting what can be done to resolve specific issues.

The goals of academic advising for student success are quite similar to the tasks involved in critical thinking. Hsu (1999) defined the following tasks for critical thinking:

- Define problems
- Identify underlying issues and causes
- Frame what should be learned and explain how it will be measured
- Gather and analyze information
- Relate findings to the issues
- Synthesize the information into satisfying resolutions
- Justify and evaluate the actions taken

Academic advising goals have been formulated by numerous sources, but the following list is taken from the most consistent goals defined:

- Identify interests, abilities, values, and educational and career pursuits
- Clarify and develop an academic plan consistent with career goals
• Understand and interpret university policies and procedures
• Determine academic or financial obstacles in meeting identified goals
• Identify possible solutions to problems
• Take action and evaluate decisions

Academic advising is a critical thinking venture. The process is logical, methodical, and systematic. The information to be processed requires the ability to reflect, project, and make rational decisions. This study will incorporate an intrusive system for addressing the student’s issues, as well as teach the student necessary thinking skills that will increase the likelihood of the student’s success, both now and in the future.
CHAPTER 3
METHODOLOGY

The influence of the Academic Concept Mapping (ACM) instrument on student progression and retention was deemed to be worthy of further study, based on the literature review of past studies, where relationships were identified between academic advising efforts and student persistence in the university. In this quasi-experimental study, the independent variable of interest, the ACM system, promotes concise, comprehensive and intrusive delivery of academic advising concepts having the strongest relationship with student persistence and progression in a university setting. The format of the system requires active participation from the student, with ongoing monitoring and critical thinking prompts provided by the instructor/advisor. The following research questions were answered during the course of the study:

Research Question 1

Will freshman students at a four-year comprehensive university in the South, who participate in the ACM instrument, achieve higher grade point averages at the end of the first semester than the grade point averages of those who receive traditional advising, as delivered in a freshman seminar course?

It was anticipated that the activities involved in the ACM instrument would increase the students’ awareness of grades and outcomes on academic plans to the degree that the students would become more conscientious in the immediate time frame. It was assumed that as the students were guided (intrusively) to continue gauging their progress in a course, they would make better decisions that would improve academic performance. For answering the first research question, semester grade point averages were queried from the university’s student
record system for students enrolled in the identified 12 sections of the freshman seminar course. Any student who did not sign a consent form, or minor students whose parents did not give consent, had his or her information removed from the data, and this noted for reporting purposes.

Semester grade point averages for students in the treatment groups were compared with semester grade point averages for students in the cohort group.

**Research Question 2**

To what degree will the ACM instrument affect the persistence of freshman students at a four-year comprehensive university in the South, in comparison to those who receive traditional advising, as delivered in a freshman seminar course?

It was assumed that intrusively addressing the situations that may place a student “at-risk” for continuing in the university would be directly addressed, students would identify what help might be needed and seek that help, thus increasing the students’ likelihood for continued enrollment the following semester. For example, students who are the first in their families to seek a college degree, or students who commute long distances, or who work in excess of 20 hours a week, may need special guidance in planning a semester schedule. Guiding students to think about the success strategies for the current and following semesters should clarify questions about selecting courses, as well as motivating the students to engage in early registration activities for getting the courses they want. The data for answering this research question was collected during the spring 2007 semester through the university’s student record system, following open registration periods, regular registration periods, and late registration periods. A query was run for identifying students who had registered for classes for the following spring 2007 semester, and was checked again for confirmation after the 14-day class counts in that semester.
Research Question 3

To what degree will the ACM instrument affect the progression of freshman students at a four-year comprehensive university in the South, in comparison to those who receive traditional advising, as delivered in a freshman seminar course?

As with research question number two, it was assumed that intrusively addressing the situations that may place a student “at-risk” for continuing in the university would reduce the rate of student withdrawals and resignation from the university. Proactively and intrusively guiding students to think critically about their potential risks and obstacles should increase their ability to identify possible solutions and take action in a timely manner. Actions may include securing tutoring for a subject, assessing time management, discussing financial difficulties with parents, improving direct communication. Data for determining student progression was collected from the university’s student record system, by querying for number of course withdrawals during the fall 2006 semester and by calculating the percentage of successfully completed coursework (excluding grades of “F” and “W”) for students enrolled in the selected 12 sections of the Freshman Seminar course. Data was entered into SPSS with the field “percentage of hours completed” added. Resignations, dropping out, or all grades of “F” will have a 0% completion rate.

Research Question 4

Will freshman students at a four-year comprehensive university in the South, who participate in the ACM instrument, develop and more effectively implement critical thinking skills, as a result of problem-based learning, into their academic planning, while enrolled in a freshman seminar course?
According to Facione (2001), developer of the CTDI®, critical thinking skills can be taught through both hypothetical and experiential activities. Since the ACM instrument draws heavily on the students’ abilities to use many of the types of critical thinking skills (deduction, induction, inference, and evaluation), it was assumed that the students’ skills will be honed, and the disposition regarding the use of critical thinking skills will improve. An ACM quiz was developed by the researcher for measuring the skills that were taught as part of the study. There were 10 questions on the quiz of varying difficulty level, beginning with simple grade point average and quality point calculations, and increasing the number of academic considerations for the following questions (requiring conjecture/forecasting/prediction). The quiz items measured the student’s ability to calculate, anticipate consequences (from a given student scenario), make rational decisions (building course schedules or withdrawing from courses), and project across timelines. The quiz exemplified Hsu’s concept of “problem-based learning” (1999). Each question on the quiz was weighted as two points, for an overall score of 20.

Data was entered into SPSS for analysis after administering and collecting the tests. Subscores and total scores for the CTDI® were defined fields in SPSS. The CTDI® was administered in the chosen classes as a pre-test during the second week of class. The test booklets were given to the students along with a scantron and a #2 pencil. The instructors of the course gave instructions for taking the test. The test required 15-20 minutes for completing the 75 items. All test materials were turned in to the instructor, who placed them in a sealed envelope, with the class section marked. The researcher retrieved envelopes from the instructors. New data entry included test identification (pre/post), scale subscores and total scores. At week 13 of the semester, the CTDI® was administered as a post-test, following the same procedure as the pre-test. The ACM quiz was administered to all 12 study sections at the conclusion of the
5-day study, and was administered by the researcher, who distributed the quiz and gave instructions for its completion. All students received the quiz, a pencil, and were told to use a calculator (one was provided to students who did not have one of their own). Instructors were alerted in advance of the date for administering the quiz for the control group sections, which was on the same date as the treatment groups.

**Population and Sample**

The target population for the study consisted of first-time freshmen, self-enrolled in a for-credit student success course, at a comprehensive, 4-year, public university in the Southern portion of the United States. Because the study was quasi-experimental, the natural setting increased the likelihood of the study’s utility in similar institutional settings. Study approval was given from the Louisiana State University Institutional Review Board for Human Subject Protection; assigned IRB #E3462. Because the study took place on the campus of another institution, approval was gained from its Institutional Review Board as well (IRB#:2007-004). The study (Academic Concept Mapping instrument) was conducted during the fall 2006 semester, with follow-up on student persistence during the spring 2007 semester. The study participants were age 18 and above, except for seven participants who were 17 (parental permission was obtained for each).

The freshman seminar course typically targets study skills, student involvement in the university, and university policies/procedures. The multiple vectors of academic advising and the relationship to student persistence was not a part of the instruction prior to the study. Each fall, there are approximately 2500 first-time freshman who are advised to enroll in the freshman seminar course, across all college majors. The course is not mandated, but highly recommended to incoming students. In fall semesters, at least 15 sections of the course are offered, with each
section limited to 25 students. This study targeted students enrolled in 12 sections, for a total population of 300 students. The remaining three sections were not included, as they were created for special populations and posed an internal threat of statistical regression to the validity of the study. The students in the 12 sections in the study were self-enrolled in the section of their choice. The three instructors who were assigned to teach sections of the freshman seminar course agreed to participate. The experiences for each instructor were comparable in that each had taught for at least five years, holding a Master’s degree (two were ABD), and each had equivalent scores on the semester evaluations of teaching provided by the students. In addition to comparable years of teaching, each had experience as an academic advisor for students in a General Studies curriculum. The depth of advising for this population, who often present with no clear academic goals, prepared the instructors for targeting the array of topics necessary for helping students clarify values and other personal attributes necessary for formulating academic goals. The instructors’ educational backgrounds were varied, with one having a background in Kinesiology, one in Business and Finance, and one in Education. In addition to teaching and advising, all three had approximately three years in administrative positions.

The quasi-experimental study began during the second week of classes, with all instructors beginning at the same time. Instructors who taught sections that met three times a week began the study on Monday, and for the sections that met two days a week, the instructors began the study on Tuesday of that week. Instructor training was conducted prior to the semester onset, experiencing the ACM instrument as would the students. Each instructor was asked to select a college major, select a schedule of classes, then to complete each page of the ACM instrument. The researcher modeled how questions should be addressed during the study and demonstrated how deviations from the plan would potentially influence the study’s outcome.
Based on the extensive discussions of the potential threats to internal validity, the instructors were vigilant during the advising and course selection process and did not direct or recruit students to any section.

**Research Design**

Solomon 4-group, a study design for true experimental research, was used as a model for this quasi-experimental study to minimize potential threats to the study’s internal validity. Internal validity is the ability to correctly establish a causal relationship between the independent variable(s) and the dependent variable. High internal validity requires that the researcher incorporate full power of random assignment. Because the students were not a drawn random sample, and because they were not randomly assigned to class sections, a pre-measure was deemed necessary for accounting for non-equivalent groups for data analysis. Whenever pre-measures are incorporated into a study, especially when randomization is not used, the effects of the measure may affect the groups differently. The unique controls of this four-group design served to optimize the ability for identifying the main effects of the study, but accounting for the effects of the CTDI® pre-test. The unique features of the design are that, in addition to identifying the main effects of the treatment and the effects of administering a pre-test, it allows the researcher to describe the interactive characteristics of the treatment with the pre-test. Because the design involves use of a pre-test for equating groups, it can also indicate whether or not history and/or maturation may have influenced the outcome variable.

Experimental studies include sampling procedures to draw a representative sample for ensuring external validity (ability to generalize to the larger population). Quasi-experimental studies take place in a natural setting and with natural dynamics, so external validity is not an issue when results are generalized to populations with the same or similar characteristics and
settings (Ary et al., 2002). Internal validity is always the primary concern with experimental treatments, and the best way to control for threats to internal validity is by using the full power of random assignment. Using full power of random assignment involves randomly assigning research subjects to treatment and control groups followed by randomly assigning groups to a level of the treatment. This quasi-experimental study addressed the internal threats to validity by equating the intact-groups by using a pre-experimental measurement (CCTDI® pre-test). Even though study subjects were not randomly assigned to groups, the class sections were randomly assigned to one of the four groups created for the design. Instructors for the class sections were asked to oversee two control and two treatment sections, to allow for identifying possible teacher effects on the outcome variable. Instructors were randomly assigned to four sections (two treatment groups and two control groups) of the freshman seminar class. When students registered for the course, instructor was listed as “TBA” (to be announced), to further control for any teacher effects. The study’s results can be measured in four ways, with the groups created to examine the effects of all combinations of the pre-test with the dependent variable. Six of the sections were involved in the study activities beyond the pre and post-tests, with the remaining six serving as the control group. Group one participated in all activities of the Academic Concept Mapping instrument, and was both pre and post-tested. Group two completed the pre and post-test, but did not participate in the study activities. Group three, participated in the ACM activities, but was a post-test only group. Group four, a control group, completed only the post-test. This design allowed for the researcher to measure the effects of the pre-test on the findings, to equate the groups by using the pre-test as a covariate for more accurate calculations of the post-test. In addition to the pre-test for use as a covariate, a persistence factors survey will be distributed during the first meeting to students in all of the sections involved in the study. The
covariate selected will depend on the outcome variable of interest in each of the study objectives (Table 1).

Table 1
The four-group (modeled after Solomon 4-group) design for the 12 class sections in the ACM study

<table>
<thead>
<tr>
<th>Groups and freshman seminar class sections</th>
<th>Random assignment of sections to groups</th>
<th>Pre-test</th>
<th>Level of treatment</th>
<th>Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1 (Sec. 4, 5, 11)</td>
<td>R</td>
<td>$O_1$</td>
<td>X</td>
<td>$O_2$</td>
</tr>
<tr>
<td>Group 2 (Sec. 7, 8, 10)</td>
<td>R</td>
<td>$O_3$</td>
<td></td>
<td>$O_4$</td>
</tr>
<tr>
<td>Group 3 (Sec. 2, 12, 13)</td>
<td>R</td>
<td></td>
<td>X</td>
<td>$O_5$</td>
</tr>
<tr>
<td>Group 4 (Sec. 6, 16, 17)</td>
<td>R</td>
<td></td>
<td></td>
<td>$O_6$</td>
</tr>
</tbody>
</table>

Instrumentation

Because of the nature of the Academic Concept Mapping instrument, which involves the components of forecasting or predicting consequences, making rational, systematic decisions, and planning an academic path that will lead to meeting academic goals, the California Critical Thinking Disposition Inventory (CCTDI®) was selected for use as a pre and post-test. There are seven subscales of measurement in the instrument determined to be congruent with the literature review in identifying constructs for student success in the freshman year. The subscales include: Truth Seeking; Open-mindedness; Analyticity; Systematicity; Critical Thinking Self-Confidence; Inquisitiveness; and Maturity of Judgment.
• Truth Seeking – the characteristic of seeking best possible solutions even under the most difficult of circumstances. It is the tendency to overcome preconceived beliefs, biases and prejudice in favor of sound reason.

• Open-mindedness – the ability to tolerate the views and opinions held by others, even when in opposition to one’s own views. It is the willingness to develop new schemata that will result in a more realistic perception of one’s place in the environment.

• Analyticity – the tendency to stay alert to the dynamics of events, interactions, decisions, plans, etc. It is the ability to anticipate the consequences of the above and adjust plans accordingly.

• Systematicity – the art of organizing and strategizing for optimal success in plans and decisions. It is the tendency for one to define necessary and orderly steps to continue through a project or plan to its completion.

• Critical Thinking Self-Confidence – the tendency to trust reason and logic above affective or intuitive factors. It is the belief that sound decisions can only be made with sound reason.

• Inquisitiveness – the need for answers. It is an intellectual curiosity that compels one’s need to know and understand; seeking explanations is natural and understanding is an outcome in and of itself.

• Maturity of Judgment – the ability to accept the panoramic view of situations, with accepting that there may be multiple solutions to a given problem. It is the ability to suspend and revise judgments when necessary, but keeping in mind the ultimate need for closure.
The CCTDI® was validated through a study, the Expert Consensus Statement on College Level Critical Thinking (1990), also known as The Delphi Report. Researchers at Penn State University, with funding provided through the U.S. Department of Education (2003), conducted the study and defined the constructs of dispositional critical thinking. The test scores include a total score, which measures consistency of using critical thinking, as well as scores for the seven subscales. Using Cronbach’s Alpha, reliability of the CCTDI® is 0.90 overall, with subscale reliability ranging from 0.72 - 0.80. The instrument includes 75 items, measured on a 6-point Likert-type scale, with 1 = “agree strongly” through 6 = “disagree strongly.” Factor analytic methods revealed that there were seven non-orthogonal and non-discrete factors on which the 75 items loaded (CCTDI® Test Manual, 2000 update). Even though the items are non-discrete, the scoring process forces loadings on the seven discrete scales (Table 2).

Table 2
Factor loadings for the 75 items included in the CCTDI® subscales

<table>
<thead>
<tr>
<th>Scale Name</th>
<th>Mean Loading</th>
<th>Scale Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truth-seeking</td>
<td>.421</td>
<td>.179-.587</td>
</tr>
<tr>
<td>Open-mindedness</td>
<td>.407</td>
<td>.190-.693</td>
</tr>
<tr>
<td>Analyticity</td>
<td>.387</td>
<td>.028-.583</td>
</tr>
<tr>
<td>Systematicity</td>
<td>.458</td>
<td>.341-.610</td>
</tr>
<tr>
<td>CT Self-confidence</td>
<td>.528</td>
<td>.369-.660</td>
</tr>
<tr>
<td>Inquisitiveness</td>
<td>.500</td>
<td>.330-.646</td>
</tr>
<tr>
<td>Maturity</td>
<td>.470</td>
<td>.219-.667</td>
</tr>
</tbody>
</table>

Source: (CCTDI® Test Manual, 2000 update)

The CCTDI® was intended for use with high school students, college students and adults in educational settings for the purposes of measuring gains in learning objectives and academic
advising and determining effective instruction techniques. Administering the test requires a trained administrator, test materials, and a 15-20 minute time period.

The Academic Concept Mapping (ACM) instrument, which incorporates critical thinking strategies, is currently a pencil-and-paper product, and was developed by this investigator in 2002, based on 15 years of experience with career and academic advising and counseling. ACM is a three-page instrument. The first page extracts information from a persistence factors questionnaire, which was compiled by the researcher, based on related literature and descriptions of persistence factors. There are three categories in which each of the persistence factors on the questionnaire can be placed: academic, personal and financial. Experts in the field of student retention agree that persistence factors fall within these three broad categories, but each factor may fall in more than one category. The ACM Page 1 process begins with the student’s completing the persistence factors questionnaire (Appendix C). Next, the instructor reads an explanation of each of the factors, including how they can be categorized. Students participate by identifying and recording the risk factors on the ACM Page 1 Worksheet (Appendix C). The information from the worksheet is then synthesized for completing the ACM Page 1 (Appendix D). Students are guided by instructors, through critical thinking prompts (questions or statements) for identifying the greatest risks in each of the categories.

The data collected through a student persistence factors questionnaire serves as a point of reference for the first two pages of the ACM, leading to richer, more in-depth discussions between advisor and advisee. All of the items on the questionnaire were based on the theoretical constructs defined by student development and advising theorists (Aston, 1975; Bean, 1980; Cuseo, 2003; Gardner, 1995; O’Banion, 1972; Tinto, 1975). Data was collected by giving each
participating student a pre-treatment questionnaire (Appendix C). Items on the questionnaire addressed the following dimensions:

- Student demographics
- College major and concentration area
- ACT scores (cumulative and subscores)
- High school information
- Residence (on/off-campus, commute time, roommates)
- Job type, location and number of hours worked per week
- Financial profile (parental help, scholarships, loans, grants; responsibilities)
- Family education history (determine if first generation)
- Academic goals (grade point average, career and/or professional school, length of time for bachelor’s degree)

Each of the questions/statements on the persistence factors questionnaire is related to one of the three categories and, depending upon the nature of the question, an item may be considered to fall in more than one category for any given student. For instance, commute time may be a financial persistence factor for a student who is self-supporting as well as a personal factor (hates long commutes). Students determine the nature of the persistence factor (as a positive or negative factor), and determine whether the persistence factor is an academic issue, a financial consideration, or one of a more personal nature. The categorical placement indicates the level of control that the student may have over the factors. Figure 1 depicts the linear thought involved in completing the persistence factors questionnaire and the related activities (discussions and worksheets, Appendix C).
The general assignment for the factors is as follows:

**Academic persistence factors:**

1. Parent/guardian college graduation
2. Reported high school grade point average
3. ACT composite and subscores
4. Hours of daily study in high school
5. Hardest high school subject
6. Easiest high school subject
7. Most interesting high school subject
8. Number of high school organizations
9. College major
10. Projected time (in years) to graduate
11. Plans for graduate or professional school
12. Needed grade point average for supporting plans
13. Current number of credit hours enrolled
14. Use of catalog to review curriculum
15. Use of catalog to read course information
16. Rating of study skills

Personal persistence factors:

1. Hours a week spent reading
2. Hours per day watching television
3. Number of nights per week socializing
4. Residence description
5. Number of roommates
6. Commute time

Financial persistence factors:

1. Number of weekly work hours
2. Length of time at job
3. Flexible work hours
4. Source(s) of college support
5. Responsibility for monthly bills
6. Worry about monthly bills

During the spring 2005 semester, based on researching the effectiveness of general concept mapping techniques, and the impact on student learning and understanding, the ACM was expanded to a three-page system, incorporating concept mapping. The first page contains the graphic representation of relationship nodes, linking student goals and identified positives and negatives (indicated from collected data), across personal, financial and educational domains (Appendix D). There are three pages of preliminary work associated with the completion of ACM page 1 (Appendix C). The second page of the ACM instrument (Appendix F), dependent on completing two associated activities (Appendices E), uses color-coded matching of student
attributes to curriculum courses as a visual aid to depict the balance of classes for a given semester. Courses which involve the student’s interests are flagged with a red pencil or marker next to course prefix. Courses which involve the student’s skills and abilities are flagged with a blue pencil or marker next to the course prefixes. The ACM page 2 has a summary box for reminding the student of his or her self-identified top three skills/abilities and top three interest areas. Below the summary box, there are three course schedule boxes for planning semester course loads from fall-to-fall enrollment (from first semester freshman to first semester sophomore). The student selects the courses from the prescribed curriculum for his or her major found in the college catalog. The student is guided through a thoughtful selection process, by considering the work done for completing the first page of the instrument, as well as the preliminary work done to complete the second page (skills, abilities, and interests). The process demands careful attention to result in a balanced schedule, optimizing likelihood of success (satisfactory grade point average and progression in the student’s chosen curriculum). The courses, color-coded to match with student attributes, alert the advisor and advisee for problems and/or satisfactions. If there are no courses “flagged” that means there are no courses for the semester that are considered as matched with the student’s attributes. It is considered a more substantial “at-risk” flag if there are no courses listed in the first semester which match with the student’s interests or abilities (Tinto, 1975). The first and second pages establish the foundation for the more complex tasks addressed on ACM page 3 (Appendix H); determining “if-then” scenarios (i.e., “If I drop this class, what impact will that have on my financial package and obligations?”, “If I don’t drop this class, what impact would that have on my grade point average and my academic goals?”). A cumulative review of student goals, risk factors, potential solutions or methods for handling the risks, grade point average calculations, academic-related
interests and abilities, balancing course selection, is necessary, prior to work done on ACM page 3. The third page is a matrix, with semester columns for up to six years across the top of the matrix and rows for each course in the curriculum down the left side of the page. Students place check marks in the cells for courses in which they were currently enrolled, or in which they intend to enroll in future semesters, in the column under the appropriate semester label. The students project grades, postulate and predict, using various scenarios, such as failing a course or withdrawing from a course. Scenarios are used to stimulate rich conversation requiring critical thinking. To complete the ACM instrument, each student considers their academic goals and maps out their full curriculum, considering the semester course offerings and other course demands (studio, clinical, internship, etc.) The instrument targets comprehensive data, which reflects constructs identified by major career and student development theorists, such as student’s self-awareness, awareness of the integration of career and academic planning, and awareness of academic, personal, and financial profiles on decision-making dynamics.

As an immediate post-measurement of student learning and for use as preliminary results of the study (essentially for manipulation checks that measured the direct effects of the ACM instrument), a problem-based learning quiz (ACM quiz) was given to each student in the study during the fifth class session. The ACM quiz (Appendix I) contained 10 scenarios similar to those discussed during the fourth class session. The difficulty level increased with each question.

Procedure

The three faculty of record for the 12 sections of freshman seminar course participated in intensive training for experiencing how to deliver academic advising information via the Academic Concept Mapping instrument. The training procedures required the instructors to
experience the ACM instrument as would the student. The researcher modeled how to respond to student questions and guide students through the critical thinking process. The researcher provided university documents, catalogs, and registration materials and modeled how to use the resources for identifying sources of help, campus locations, hours of operation, and other details. The instructors experienced the “ask, don’t tell” nature of the study, which expedited the critical thinking processes. At the conclusion of the training, each instructor demonstrated knowledge through about the following:

1. Resources for academic help
2. The importance of timely communication and knowing the right office or person for contact
3. Relationships between personal, educational (academic), and financial domains
4. Grade point average calculations for a given semester, cumulative totals, and degree requirements
5. Strategies in planning for subsequent semesters, based on each semester’s outcome
6. Impact of current semester outcomes on academic goals

To control the threat of instrumentation, inter-rater reliability was addressed through intensive training procedures that directly addressed the threat of instrumentations and rater biases. The instructors were taught the nature, purpose, importance and dynamics of the study, and participated in a discussion on how small decisions in providing more or less help for any student may influence the outcome of the study. Each of the instructors was given a full set of materials, including daily instructions and scripts for certain parts of the activities, ensuring consistency in delivery. The ACM instrument required five full class periods.
Class session 1 (Monday and Tuesday, September 11 and 12, 2006): Instructors read script to students on the purpose and importance of the study (Appendix A), and then distributed the student consent forms (Appendix B). The consent forms and the student’s participation were explained, and student questions were answered. Students were asked to sign the forms as agreement for their data to be included in the study. The consent forms were turned “face down” on the desk, then collected by the instructor and placed in an envelope which was given to the researcher. After the forms were collected, three of the treatment sections and three of the cohort sections, were pre-tested, using the California Critical Thinking Disposition Inventory (CCTDI®). The instructor distributed the CCTDI® pre-test, a 15-20 minute assessment, which was administered to all students in those sections regardless of their agreement to have their data used in the study. This ensured that students would not be identified as a non-participant. Following the pre-test, all students in the treatment and cohort sections received and completed the student persistence factors questionnaire. The questionnaires had two copies; one for class session use and one turned in to the researcher. The instructor placed the researcher copies of the persistence factors questionnaire in an envelope marked with a class section number. The researcher included the class section numbers as a value when entering the data into SPSS. After completing the CCTDI® and the persistence factors questionnaire, the cohort sections followed the usual course syllabus for the remainder of the semester, with the exceptions of taking the ACM quiz during the last session of the ACM activities (Monday and Tuesday, September 25 and 26, 2006) and completing a CCTDI® post-test during the last week of classes (Monday and Tuesday, November 27 and 28, 2006). Parents of minor students, who had signed the consent forms, were contacted for permission. Parental consent forms (Appendix B) were sent and collected via FAX, before including the student data in the study.
Class session 2 (Wednesday and Thursday, September 14 and 15, 2006): The students in the treatment sections received their copy of the persistence factors questionnaire, an ACM Worksheet (Appendix C), a pencil, and the first page of the Academic Concept Mapping instrument (Appendix D). The instructors read from a script for the class activity of processing the information the students provided on the persistence factors questionnaire. For each of the persistence factor items, the instructor read a brief explanation of that factor, and the students determined if their answer to that item had or would have a positive or negative impact on their academic performance. The students were provided with a description of the item (from the faculty script), an explanation of how it could impact academic performance, and suggested if that factor could have an academic, personal, or financial origin (or possibly a combination). The origin, or source, of the risk factor prompted further explanation about whether or not the student may have control (and to what degree) over that factor. The student’s evaluation of the item superceded the description provided by the instructor, and the students placed the item number in the appropriate column and category (e.g., academic, positive). The instructor asked the students to hold personal questions about any of the factors until the end of the activity, so that personal information could be discussed in a confidential manner. When all items had been marked as positive or negative and placed under the appropriate category headings, the students were given time to process the information and make determinations about the most notable risk factors and success factors. Students with questions were able to receive one-on-one help during this time. When the students were able to identify the major risk factors, they completed the first page of the Academic Concept Mapping instrument (Appendix D), by placing the greatest academic, personal, and financial risk factors in the boxes provided. The final task for ACM page 1 was to critically determine how those risk factors impacted their academic goals and to
identify effective strategies for addressing and minimizing the risks involved. Students were reminded to consider what they had direct control over, who else may have control and what strategies would be necessary for approaching other key sources of control. At the bottom of the worksheet, the students entered their goals in an abbreviated form, and explained their strategies to minimize risk for meeting their goals. This part of the ACM instrument required extensive critical thinking. Students might indicate “reduce work hours” as a strategy, but would then be instructed to think about the consequences of working fewer hours for other areas. They might reduce one risk, but create another. Students were asked to continue critically thinking about the persistence factors, noting any new information that may arise, before the third class session. An exhaustive list of the persistence risks, effective and acceptable strategies for optimizing success in reaching academic goals was noted by each student and served as a point-of-reference for the remainder of the ACM instrument.

Class session 3 (Monday and Tuesday, September 18 and 19, 2006): Students were provided with pencils, course catalogs, semester course offerings guide, and a calculator (most students had their own calculators). The instructor returned the copies of the ACM page 1 to the students, instructing students to add any updates they felt were necessary before proceeding to the work necessary for completing the ACM page 2 (Appendix F). Each of the students was given a worksheet for practicing grade point average calculations and one for identifying personal interests and abilities (Appendix E). They were instructed to check the skills/abilities that they felt were highly developed, as in comparison to their peers. They were instructed to check their strongest interest areas by reflecting on the types of books, movies, television programs, magazines, articles that have been the most captivating. Interest areas did not have to be related to skills and abilities, and were defined as topics that were “attention grabbers.” Once
the students completed the checklist, they were instructed to identify three of their strongest skills/abilities and interest areas from the lists to place in the upper portion of the ACM page 2 (Appendix F). Instructors gave each student a red and a blue marker. Students entered their current course schedules into the spaces provided on ACM page 2. Students read the course descriptions when necessary, for determining if their skills/abilities or interest areas were implied in the course descriptions. For courses that incorporated the student’s interests, the course was coded by placing a red dot beside the course prefix. For courses that incorporated the student’s abilities, each course was coded by placing a blue dot beside the course prefix. Instructors explained that courses marked with at least one, or preferably both colors, may be less demanding for students because of the level of expected engagement, than courses that had no marks. Students considered their risk factors from ACM page 1 and the number of courses they determined as less engaging, for determining the best strategies to incorporate for the given course load. Based on their self-knowledge and course knowledge, students predicted their semester grades in each course. Students were guided through the process of calculating their semester grade point averages for their projected grades. Based on their projected “passing” grades and successful first semester, the students used the college catalog to plan for the next two semesters. For unsatisfactory grade projections, “D” or lower, in major courses, the students entered that course again for the next semester. For elective courses, the students chose to repeat the course or not. Instructors explained that repeating non-required courses was not beneficial for any level of grade point average calculations. When planning the second and third semesters, students referred to their identified risk factors, their skills/abilities and interests when building each semester schedule, and the necessity of taking a course in the semester of consideration (some courses could be put off until a later semester). The instructors explained that a good
strategy would be to include a balance of courses (those that may be engaging along with those that may be more challenging), while considering when courses were offered and pre-requisite conditions. The students were told that there would be a later grade checkpoint for confirming or adjusting their predicted grades for the courses in which they were currently enrolled. At the grade checkpoint, the students wrote the same or new projections on the provided column on ACM page 2. The purpose of announcing the grade checkpoint was to increase the likelihood of students’ vigilance in keeping up with graded items in each of their classes. The instructors kept the ACM page 2 until the grade checkpoint, October 9, 2006, which was the date that term one classes ended. This date was selected because of the decisions that had to be made about course withdrawals and the possibility of needing to add a second term course. Students in the ACM and control groups were given the information about withdrawal deadlines and final dates for adding term two classes. A copy of the second page of the ACM was collected by the instructor at the grade checkpoint, placed in a sealed envelope, which was marked with the class section. The researcher retrieved the envelopes from the instructors for entering the data into SPSS.

Class session 4 (Wednesday and Thursday, September 20 and 21, 2006): Students were provided with pencils, calculators, semester course offerings guide, and college catalogs. The students used the ACM page 2 for beginning the last page of the study. Each student received the ACM page 3 (Appendix H) that reflected their college major. The instructors were provided with a detailed script (Appendix G), were asked to adhere closely to the wording, and to directly answer university policy questions, but to answer questions of a subjective nature with another guiding question. ACM page 3 exhibits a matrix design, with courses listed in the left hand column and semester labels at the top of each column (Figure 2).
Figure 2. Cropped image from upper left portion of ACM page 3.

The lower portion of the left hand column, below the list of courses, contains headings and cells for the number of hours scheduled, hours earned with regular grades (excludes grades of “W” or “P” or “U”), and semester, cumulative, and degree quality points and grade point averages (Figure 3).

Figure 3. Cropped image from lower left portion of ACM page 3.

The ACM page 3 form can be used for tracking purposes and for forecasting the academic plan (number of years to completion), and for calculating each level (semester, cumulative and degree) of grade point averages. To begin the ACM page 3, students entered the semester codes across the top of the matrix (Fall 2006 = 2068, Spring 2007 = 2073, Fall 2007 =
2078, etc.) for each semester included in their plans (summer sessions may be added, with a code of “5” after the year; Summer 2007 = 2075). Codes were used instead of the actual semester years to teach students to correctly identify the semesters in the online advising and registration systems. After the semester codes were entered, the students placed check marks beside the courses of current enrollment, under the correct semester heading, then placed check marks for the next two projected semesters (already selected and written on ACM page 2). Students placed the projected grades for the first semester in the column heading “Grades.” Using the formula for calculating quality points, the students entered the quality points in the appropriate column (heading) for each of the courses. For grades of “W” or “F,” the corresponding “quality points” cells have a zero (Figure 4).

<table>
<thead>
<tr>
<th>Courses</th>
<th>Credit Hours</th>
<th>Grade</th>
<th>QP</th>
<th>Semester 2068</th>
<th>Semester 2073</th>
<th>Semester 2075</th>
</tr>
</thead>
<tbody>
<tr>
<td>ART 105/106/ THEA 131/ MUS 151</td>
<td>3</td>
<td>B</td>
<td>9</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ART 105/106/ THEA 131/ MUS 151</td>
<td>3</td>
<td>C</td>
<td>6</td>
<td></td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>BIOLOGICAL SCIENCES</td>
<td>4</td>
<td>A</td>
<td>12</td>
<td></td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>COMM 211</td>
<td>3</td>
<td>B</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 4. Cropped image from upper left portion of ACM page 3 with courses selected by semester, and grades and quality points entered.

Students were instructed to calculate the semester grade point average for their projected grades (cumulative will be the same for the first semester). For failed or withdrawn courses, students were instructed to “rethink” their plans for the next two semesters, determine how the grades impacted their stated academic goals (always a focal point, and written on the top of the ACM page 3), and to decide how to proceed to most quickly get back on track for meeting those goals. This required calculating the semester and the cumulative grade point averages. Students
were told to make any necessary changes to the planned out schedule of classes for the second and third semesters, based on the failed or withdrawn courses in the first semester. The purpose of that was to allow the students to visually see how a single decision in one semester can have far reaching effects on subsequent semesters. They next projected grades for the second semester, and repeated the quality point and grade point average calculation. Before going to the third semester, the students identified what they believed would be their most difficult course(s), and recalculated by entering a W, D, or F for at least one of those courses. This required adjustments to the map (pencil work is necessary). For W, D, or F grades, it was stressed that the course would have to be repeated if it is required in their major. Students were guided to critically think about progression issues and long term goals of grade point average, field requirements, internships, professional or graduate school, etc., and make important decisions for planning a third semester. Students were then taught about the purpose, benefits and limitations of the degree grade point average. If and when to repeat a course is a major consideration for calculating degree grade point averages. The students calculated all three levels of the grade point average by projecting unsatisfactory grades for their current or second semester and made necessary changes to the planned schedules for the following semester. At this point, the instructors provided individual help to students who were experiencing difficulty in making decisions on how to proceed, by asking thought-provoking questions, and those students who felt confident were instructed to continue making semester plans until all courses were checked. According to the premises of concept-mapping (Spicer, 1998), mapping out a full plan increases the likelihood of success. Gordon (2002) stressed that clearly defined career and academic plans precede successfully reaching career and academic goals. Seeing the plan is one of the most important aspects of the ACM page 3. Cunningham and Stewart (2002) described Causal
Influence Diagramming (CID) as the precursor for premeditated action. Figure 5 offers a brief glimpse into how the semester plans visually depict the extent of a student’s progression in his or her prescribed curriculum and the impact of decisions made. Cells with check marks and grades in a course indicate repeated courses, thus will impact the degree hours, quality points and grade point average (corresponding shaded rows at the bottom of the ACM page 3).

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Type</th>
<th>Grade</th>
<th>Repeated</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSYC 350/422/457/482</td>
<td>3</td>
<td>D/C</td>
<td>3/6</td>
<td>✓</td>
</tr>
<tr>
<td>PSYC GENERAL ELECTIVE</td>
<td>3</td>
<td>W/B</td>
<td>/9</td>
<td>✓</td>
</tr>
<tr>
<td>SOCIOLOGY</td>
<td>3</td>
<td>C</td>
<td>6</td>
<td>✓</td>
</tr>
<tr>
<td>SS ELECTIVE</td>
<td>3</td>
<td>F/B</td>
<td>0/9</td>
<td>✓</td>
</tr>
</tbody>
</table>

Figure 5. Cropped image from lower left portion of ACM page 3, demonstrating fall-to-fall academic planning (selected courses, grades, and grade point averages).

Checkmarks beside courses from the first semester were not erased, nor were grades. A checkmark beside the same course in another semester helps to identify repeated courses. The grade column contains the initial grade projection and the repeated grade projection for understanding the dynamics of the degree grade point average. Grades in the column were separated by a forward slash, with the second grade being the last grade. After completing the “worst case scenario” and projections for the first two semesters, the students have the information for continuing to project across more semesters. ACM page 3 was not collected from the students, but was kept for ongoing thoughtful planning and student-prompted class discussions while enrolled in the freshman seminar class. The standardized portion of the study
was completed at class session five (with the exception of the post-test). The students and instructors were able to continue discussions about the ACM page 3, or other issues, but instructors followed the basic rule of “ask, don’t tell,” allowing the students to do the processing, deciding, and planning. When students approached the instructors with questions, after the five days of the structured activities in the study, instructors responded with “What do you think is the most important issue right now?”, or “If you decide to do ________________ , what outcomes would you expect?”, or “What can you do to improve the situation?” The instructors refrained from giving the answers or telling the students what they believed would be the best solution. “Fact reporting” was a part of all discussions, when questions arose about university policies and procedures, or other questions that were not personal choices for the students to process. Students were allowed to keep the ACM page 3 for completing an academic plan for their entire curriculum. For students who were “Undecided” majors, or students who had doubts about their major, additional copies of the ACM page 3 were provided at the student’s request. As the students mapped out their curricula on the ACM page 3, they noted “fall only courses,” “spring only courses,” and completed the calculations for the first three semesters (determining hours successfully completed, quality points, and grade point averages for all semester, cumulative and degree levels). The ACM page 3 was checked by the course instructor for noting completion of the project.

Class session 5 (Monday and Tuesday, September 25 and 26, 2006): A 10-item ACM quiz (Appendix I) was given to each student in the study in both the ACM and control groups. The quiz posited scenarios that were similar to those targeted during the completion of ACM page 3, involving grade point average calculations, critical thinking, and knowledge of university policies. The students in the treatment groups applied their knowledge and skill gained during
the previous class sessions as the completed the pages of the ACM instrument. The control
group also received the 10-item quiz but with no preparation, other than incidental conversations
that may have arisen on similar topics as the course followed the original syllabus. The quiz was
used to measure the direct effects of the ACM instrument as a critical thinking tool.

All students in the 12 sections of the study were given the CTDI® post-test, during the
last week of classes (Monday and Tuesday, November 27 and 28). The pretest and post-test
forms were properly coded for student, class section, and pre/post. Instructions were read and
the students completed the 75-item test. The test forms were collected, organized, packaged and
mailed to the test developers for scanning and scoring the forms. The raw data for the tests,
along with a brief descriptive analysis was sent back to the researcher on a CD in an excel file,
for downloading into SPSS.

Data Collection

Data were collected from the participating students over the structured five class sessions,
and at the end of the semester. In addition to the direct measures collected during the ACM
study (persistence factors questionnaire, ACM quiz, and CTDI® pre and post-tests), data were
also collected from the university’s student record system (SRS). Data collected from students
on the persistence factors questionnaire included 1) student identification, 2) freshman seminar
section, 3) demographics of age, gender and ethnicity, 4) academic persistence factors, 5)
personal persistence factors, and 6) financial persistence factors questionnaire. The CTDI®
measured the propensity for incorporating critical thinking skills and the ACM quiz measured
the ability to apply critical thinking skills to academic scenarios. Data collected from SRS
included 1) number of semester hours completed for each student, 2) semester grade point
average, and 3) whether or not the student registered for next semester, as noted by the spring
2007 14-day class count reports. The SRS system was used to check accuracy in ACT scores and hours enrolled, or to enter that data if it was missing on the persistence factors questionnaire.

**Data Analysis**

Once all of the data had been collected, the researcher coded and entered the data into SPSS. Statistical analysis was conducted to answer the research questions, and determine if the objectives of the study had been met. A combination of statistical procedures was conducted, including description statistics, analysis of variance, analysis of covariance, multiple regression analysis, and logistic regression analysis. Each of the five study objectives determined the statistical procedure used, and guided the explanation of how the data was analyzed.

**Objective 1:** To describe undergraduate students enrolled in a four-year public university in the South by whether or not they participated in the ACM academic advising system on age, gender, ethnicity, and by selected academic, personal, and financial persistence factors.

Demographic variables were summarized using descriptive analysis in SPSS. Gender and ethnicity are nominal data and were described using frequency and percentages in categories. Age is ratio-level data, and was described by measures of central tendency of mean, median; variability as measured by standard deviation; and measures of symmetry will include skewness and kurtosis. Any non-normal distributions were reported, as will outliers for age or missing data. All demographic variables were described by section number and by course instructor.

The information for the academic, personal and financial persistence factors was extracted from the persistence factors questionnaire (Appendix C). Each of the questions were related to one of the three domains, and, depending upon the nature of the question, an item may have been considered to fall in more than one category for any given student. For instance, commute time may have been reported by a student as being both a financial and educational
(academic) persistence factor. Some of the persistence factors were not considered to be of importance in isolation, but collectively, gave information about clarity of goals or information about past academic performance (i.e., reported high school hours of study, hardest or easiest high school subjects, or anticipated time-to-graduation). Students who are responsible for paying monthly bills was not the key issue, but worry about paying those monthly bills was viewed as having the greatest impact on a student’s ability to focus on academic demands. Only 12 of the 28 factors were considered to be useful in the data analysis due to the nature of the factor and the immediate impact on academic performance.

Academic persistence factors:

1. Parent/guardian college graduation
2. Reported high school grade point average
3. ACT composite
4. Hours of daily study in high school
5. Hardest high school subject
6. Easiest high school subject
7. Most interesting high school subject
8. Number of high school organizations
9. College major
10. Projected time (in years) to graduate
11. Plans for graduate or professional school
12. Needed grade point average for supporting plans
13. Current number of credit hours enrolled
14. Use of catalog to review curriculum
15. Use of catalog to read course information

16. Rating of study skills

(Academic persistence factors 1, 3, 13, and 16 were used in data analysis.)

Personal persistence factors:

1. Hours a week spent reading

2. Hours per day watching television

3. Number of nights per week socializing

4. Residence description

5. Number of roommates

6. Commute time

(Personal persistence factor 5 was not included in data analysis due to lack of variance in student responses; those who lived at home reported zero roommates, those who lived in both on-campus and off-campus housing reported one roommate; thus “number of roommates” was considered as embedded in the factor “residence.”)

Financial persistence factors:

1. Number of weekly work hours

2. Length of time at job

3. Flexible work hours

4. Source(s) of college support

5. Responsibility for monthly bills

6. Worry about monthly bills
(Financial persistence factors 2, 3, and 5 were not used in data analysis; all students who worked reported having some flexibility in work hours (or left the item blank), and factor 5 was viewed as a subset of factor 6.)

Data were analyzed using descriptive statistics for determining central tendency for each of the persistence factors. The following factors were collected with nominal level data: residence, source(s) of college support, worry over monthly bills, and parent/guardian college graduation. Worry over paying monthly bills was a dichotomous variable. For nominal data, measures include frequency and category percentages. Rating of study skills was ordinal data, and allowed for one of three choices, “Excellent,” “Fair,” and “Needs Improvement.” That measure included analysis using median, with checking variability of responses through semi-interquartile or interquartile calculations. Interval and ratio data was analyzed for central tendency with measures of mean and median. In addition to the measures of central tendency, variance of the data was analyzed for standard deviation from the mean, and symmetry (skewness and kurtosis) was measured against the normal distribution. The persistence factors that involved interval or ratio-level data were ACT composite, current credit hours, weekly work hours, commute time, weekly hours reading, daily hours watching television, and number of nights out per week for socializing.

Objective 2: To compare, for the purpose of providing preliminary results, the propensity for incorporating critical thinking skills, as measured by the California Critical Thinking Disposition Inventory (CCTDI®), and the ability to apply critical thinking skills, as measured by the ACM quiz, among undergraduate students enrolled in a four-year public university in the South by whether or not they participated in the ACM academic advising system.
The CCTDI® scores of the ACM group and the cohort group were compared using ANCOVA, statistically controlling for an undue effect on the outcome variable (CCTDI® scores) with pre-test scores as the covariate. The pre and post test scores were considered to have a close association, as is the supposition for selecting the four-group design. Each teacher had two treatment groups and two control groups that were compared by class section and by group type (treatment versus control). Because there were unequal group sizes, to account for the imbalances type III sum of squares was used, which is preferable because it calculates the sums of squares for each effect, one at a time, after correcting for the other factors. The frequency of observations does not affect type III sums of squares. This is especially important because normally with ANCOVA the interaction degrees of freedom would be equal across groups. With unequal group sizes the degrees of freedom may differ. Type III sums of squares correct the inequality. Before any analysis was done, tests of assumptions were conducted. ANCOVA assumes that the data comes from a random sample, is normally distributed, and has homogeneous variance of the residuals. The study participants were not randomly assigned to groups, but groups were randomly assigned to the levels of the treatment. Use of type III sums of squares and covariates were used to control type I error. The assumption of normality was tested with a histogram and a scatterplot of the residuals. The homogeneity of variance assumption was tested using Levene’s test, and the Brown-Forsythe test; non-significance at the .05 level means the assumption is met. The Brown-Forsythe test, a test of robust means, is more sensitive to outliers and avoids the influence of outliers on sample means. When running ANCOVA, if any of the assumptions are not met, data transformation techniques may be necessary for comparing group means. The proportion of variance due to treatment (main effect)
and variance due to error was measured using the F-test (Fisher’s exact test). For identifying where significant variances lie, post-hoc analysis was conducted using Bonferroni.

As with the comparison of the CCTDI®, the ACM quiz scores of the ACM group and the cohort group were compared using one-way ANOVA. Each instructor’s treatment and control groups were compared. To account for unequal group sizes, type III sums of squares was used to run the model, because it calculates the sums of squares for each effect, one at a time, after correcting for the other factors. The frequency of observations does not affect type III sums of squares, and discrepancies in degrees of freedom are corrected. Before any analysis was done, tests of assumptions were conducted. Because the independent variable “class sections” had more than three groups, Bonferroni post hoc analysis was conducted for identifying where differences existed. The comparisons made for the second objective were essentially manipulation checks that demonstrated the direct effects of the ACM instrument. The outcomes were preliminary results, foundational for understanding objectives three, four and five.

**Objective 3:** To determine the correct model fit for explaining a significant proportion of the variance in students’ academic achievement (as measured by semester grade point average), by selected persistence factors and by whether or not they participated in the ACM academic advising system, of undergraduate students enrolled in a four-year public university in the South.

Multiple regression analysis (MRA) was considered the most appropriate statistical analysis procedure for meeting this objective. Semester grade point average (GPA), the dependent variable, was obtained for each student in the study through transcript data retrieved from the student records system. GPA is ratio-level data, due to having an absolute zero, and serves as a primary measure of academic achievement. Stepwise multiple regression analysis
was selected as the most appropriate MRA technique to explore the influence on grade point average of certain persistence factors and by whether or not the students participated in the ACM study. The goal of stepwise MRA is to find the best model for explaining the proportion of variance in the dependent variable, by identifying the smallest subset of predictors that will account for the greatest proportion of variance. MRA assumes there is a linear relationship between the predictors and criterion variable (Hinkle et al., 2002), and based on the literature review for this study, the abilities to forecast/predict, analyze, and critically think have a strong relationship to academic achievement in college students. Each of the predictors will be assessed for its bivariate impact on the dependent variable. Any predictor that does not significantly contribute (at least 1%) (Pedhazur, 1997) to the variance in the dependent variable will be dropped from the model. Of the predictors selected, “ACT composite,” “hours enrolled,” “work hours,” and “hours reading” are interval/ratio-level data; the predictors “ACM study,” “gender” and “bills worry” are nominal dichotomous, and were recoded for the analysis, with 1 = “ACM group” and 0 = “control group,” 1 = “male” and 2 = “female,” and 1 = “no worry” and “2 = worried.” “Study skills” was ordinal, with 1 = “needs improvement,” 2 = “good,” and 3 = “excellent.” “Financial help” was categorical, with 6 categories: 1 = “TOPS scholarship (a state of Louisiana tuition assistance scholarship),” 2 = “Federal grant,” 3 = “Loans,” 4 = “combination 1, 2 and 3,” 5 = “parents/family,” and 6 = “self.” Recoding does not indicate value or rank, but simply indicates group membership for purposes of including the data in the analysis using MRA (Pedhazur, 1997). Stepwise MRA, which is truly exploratory in nature, was used to analyze the proportion of variance explained by each of the predictors, with the factor accounting for the greatest amount of variance entered first in the model. The predictors were entered into SPSS, stepwise, allowing the analysis to determine the order of predictors in the model. The
probability index for a factor to be included in the equation was set at .05, with the probability index for exclusion from the model, F = .10. Factors that contributed at least 1%, and allowed the model to maintain significance, were accepted into the model.

MRA assumes there is a correct model fit (linearity), homoscedasticity of the residuals, approximately normal distribution of the data, lack of error in measures of the dependent variable, and independence of error terms (essentially random samples). It also requires that the data be metric for both the dependent and independent variables, and there is no perfect collinearity among the independent variables. To make sure that none of the assumptions were violated, initial examination was conducted using scatterplot and histogram of the residuals for determining homoscedasticity and normality of distribution. Regression diagnostics for detecting outliers and their influence on the regression slope and regression coefficients (Cook’s D, Leverage, standardized residuals, and DFBETA) were run for closer scrutiny to determine if suspicious measures of the dependent variable should be kept or deleted from the data set. Standardized residual values of +/- 2.0 were cut-off points for scrutiny. Cook’s D, a diagnostic which reveals influence on both the regression slope and the intercept, allows for a maximum parameter of 1.0, with above a .45 warranting scrutiny (Pedhazur, 1997). Leverage, which is solely a function of the independent variable, has a maximum parameter of 1.0, but with scrutiny warranted at below that point. For both Cook’s D and Leverage, the most important consideration is the difference in the values among the entire data set. If there are several influential points that have a somewhat homogenous span from 0 – 1.0, then concern may not be warranted. When there’s a large gap between values, there is more cause for concern. DFBETA values represent what the regression estimates would be if certain cases were removed from the
data set. Pedhazur (1997) cautions against arbitrarily removing an influential point, as the outlier may offer insights necessary for richer explanation of findings.

Once the assumptions were tested, collinearity diagnostics were conducted. Collinearity refers to the degree to which the independent variables jointly explain the proportion of variance in the dependent variable. The purposes of checking for collinearity are for model efficiency and avoidance of predictor redundancy. When two predictors have perfect collinearity, they are considered “singular,” which means that that only one of the predictors is necessary. They are measuring the same thing. When testing for collinearity, the researcher should consider the regression coefficient, the tolerance and variance inflation factor (VIF) indices. For high correlations, low tolerance values and high VIF values (overlap or redundancy of measurement by certain independent variables), the predictor under investigation adds no significant explanation of variance to the model. High VIF (tolerance = 1/VIF) values for a predictor mean that only a very small percentage of variance is not explained by other predictors (thus, redundancy) (Pedhadzur, 1997).

**Objective 4:** To determine the correct model fit to explain a significant proportion of the variance in student progression, as measured by the percentage of scheduled courses completed, by selected persistence factors and by whether or not they participated in the ACM academic advising system, of undergraduate students enrolled in a four-year public university in the South.

The procedure for conducting the analysis for meeting this objective is virtually identical to objective 2, with the difference being the dependent variable. Multiple regression analysis (MRA) was considered the most appropriate statistical analysis procedure. The dependent variable, “percentage of scheduled courses completed,” was determined for each student by
calculating the proportion of hours attempted versus hours earned (with the exclusion of non-graded classes). Student transcript information was extracted from the university student records system. Percentage of scheduled courses completed (progression) is ratio-level data. As with objective 2, stepwise multiple regression analysis was selected as the most appropriate technique to explore the influence on academic progression by the selected persistence factors and by whether or not the student participated in the ACM study. After testing the assumptions for running MRA, testing the regression diagnostics and collinearity of the predictors, the model was run for determining the best model for explaining the proportion of variance in the dependent variable, by identifying the smallest subset of predictors that will account for the greatest proportion of variance.

**Objective 5:** To determine the correct model fit to explain a significant proportion of the variance in student persistence as measured by whether or not the student was enrolled on the 14th class day of the spring 2007 semester, by selected persistence factors and by whether or not they participated in the ACM academic advising system, of undergraduate students enrolled in a four-year public university in the South.

The measure of student persistence was a dichotomous, categorical variable, so the most appropriate statistical procedure for analysis was logistic regression. Logistic regression does not hold the same assumptions as do regression techniques for analysis involving a metric dependent variable. The model does assume independence of the error term, which is essentially stating that there must be random sampling. The data does not have to meet the assumptions of normality, homoscedasticity, or linearity. The goal of using logistic regression is the correct classification or grouping of data into a binary response set, using the most parsimonious model. Logistic regression has only two categories, with values of 0 and 1 (Bernoulli variable), and the
predictors can be categorical, or a combination of metric and categorical data (Pedhazur, 1997). The relationship between the independent variables and the dependent variable is not linear. The logistic regression function is used, or the logit transformation. In the model, the response or outcome variable has a value of 1 assigned, with a probability of success = P, or has the value of 0 assigned, with a probability of failure = 1 - P. When there are several predictor variables, each can be entered into the model through the same methods as for multiple regression analysis, with the order of entry deliberate, or through stepwise entry (exploratory), to test the fit of the model by noting the coefficient following the addition of each predictor. Stepwise regression, used in logistic regression analysis, is fully exploratory, making no a-priori assumptions concerning the relationships between the response/outcome variable and the set of predictors. Logistic regression has two primary uses: to predict group membership and to account for the percent of variance in the dependent variable attributed to the predictors. The model calculates the probability of success or failure, giving results in the form of an odds ratio. The dependent variable is a “logit” in logistic regression, as it is the natural log (ln) of the odds of an event occurring or not occurring. Odds and probability are related but not the same; the probability for 9/1 odds and the probability 1/9 odds yield very different values, as probability value is a mathematical calculation of the odds. Probability scores range from zero through infinity, and are difficult to interpret without a log transformation. The transformation will result in probability values being symmetrical around zero. The formula for calculating logit is:

\[ \text{Log(ods)} = \text{logit (P)} = \ln \left( \frac{P}{1-P} \right) \text{ and logit (P)} = a + bX \]

Odds are linearly related to the predictors, but probability is nonlinear. To calculate probability, log has to be removed from the equation using the following formula that produces the sigmoid curve, a defining feature of logistic regression:
\[ \ln(P/1-P) = a + bX \quad P/1-P = e^{a+bX} \quad P = e^{a+bX} / 1 + e^{a+bX} \]

Correlation coefficients are used to determine inclusion (0.05) or exclusion (1.0) from the model. One of the most frequently used tests of significance is the Hosmer-Lemeshow test of the goodness-of-fit. This procedure involves setting up 10 ordered groups, then dividing the subjects into these deciles. A comparison is made of the observed number of subjects in each group against the expected (or predicted) number. Hosmer-Lemeshow uses the chi-square statistic, and with non-significant results confirms that the model prediction and the actual are not significantly different.

Initial probability calculations for group membership, without considering any predictors, was 0.50. For the students in this study, who are considered independent in this analysis, the probability for the whole group would be 0.50^{258}, which would be difficult to manage, so a natural log transformation is necessary for improving interpretability. After transforming, the value is multiplied by (-2) to create positive results. A first solution provided, using SPSS, shows the values of the natural log transformation without considering any predictors, which serves as a baseline measure. When predictors are included in the model, the loss function (similar to estimates of least squares) is computed, giving a difference value (between intercept only calculation and one with predictors). This procedure, termed the -2likelihood ratio, uses a chi square process to determine goodness-of-fit (or badness-of-fit) of the data. The overall purpose for using logistic regression with this data set is to find significant predictors for student persistence in the university setting.
CHAPTER 4

RESEARCH RESULTS

The purpose of this study was to determine if there was a difference in academic performance (grade point average, progression, and persistence) of freshmen students in a 4-year comprehensive, public university in the South, by whether or not they participated in the Academic Concept Mapping study. The researcher sought to define the ACM instrument as an effective strategy for positively impacting student grades, persistence in the university, and progression (as predetermined by student intent and goals) in the student’s chosen curriculum. The ACM study was a quasi-experimental study involving students who self-enrolled in a 3-credit hour, graded, freshman seminar class in the fall 2006 semester. The students enrolled at various registration periods during the spring, summer and fall 2006 semesters. Out of 15 sections of the freshman seminar course taught in fall 2006, 12 were selected for inclusion in the study (the remaining three were designated for special populations). Each of the sections was capped at 25 students and all sections were filled to capacity prior to the semester’s onset. Three freshman seminar instructors participated in the study, each teaching four of the sections. The four sections for each of the instructors were randomly assigned as a treatment or control group, by drawing the section number (concealed on a sheet of folded paper) from a container and placed on one of four squares; two labeled treatment and two labeled control. Before the first meeting for the study, the instructors participated in extensive training and were made aware of the possibility of rater-biases and how to avoid such situations. The premise of “ask, don’t tell” served as the safe-guard for consistency of responses to student inquiry. Instructors confirmed that their courses were filled to capacity prior to the beginning of the study, but none had 100% attendance during the first two weeks of classes. Out of the 300 students enrolled in the
freshman seminar class during the fall 2006 semester, 258 cases were included in the study. The remaining 42 students did not attend any of the freshman seminar classes during the fall 2006 semester, and were not included in the university provided 14-day class rosters. Over the course of the study, student absences on the days study measures were taken had an insidious impact on data analyses. There was no way to control for the absences, nor was there a way to determine the impact of the study for those students. The information for determining mortality was difficult, as student absenteeism was irregular. The total counts for the pre-measure, the 5th session quiz, and counts for the post-measure were considered the most appropriate determinants of the threat to internal validity based on mortality of study participants.

Information on semester grade point average, number of hours completed, and subsequent semester enrollment was available through the university’s SRS and was recorded for all 258 students. There were 22 cases missing scores for the ACM quiz, and 48 cases missing CCTDI® post-test scores. Twenty-one of those cases were missing both the ACM quiz and the CCTDI®, thus were not included in the analysis for objectives 3 through 5. The persistence factors questionnaire had possible inconsistencies of responses by students on items requiring a time frame (minutes, hours, days, weeks), thus will require reader alert for those analyses. For example, students may have, based on extremes in responses, reported hours watching television on a weekly basis, rather than on the question request for daily number of hours of television. Missing or unusual data from persistence factors will be reported in the descriptive analysis.

Specific objectives were formulated to guide the researcher’s analysis of the data, which included:

1. To describe the students enrolled in the selected freshman seminar course sections on age, gender, ethnicity, and by educational, personal, and financial persistence factors, of
undergraduate students enrolled in a four-year public university in the South by whether or not they participated in the ACM academic advising system.

2. To compare the propensity for incorporating critical thinking skills, as measured by the California Critical Thinking Disposition Inventory (CCTDI®), and the ability to apply critical thinking skills, as measured by the ACM quiz, among undergraduate students enrolled in a four-year public university in the South by whether or not they participated in the ACM academic advising system.

3. To determine the correct model fit for explaining a significant proportion of the variance in students’ academic achievement, as measured by semester grade point average, by selected persistence factors and by whether or not they participated in the ACM academic advising system, of undergraduate students enrolled in a four-year public university in the South.

4. To determine the correct model fit to explain a significant proportion of the variance in student progression, as measured by the percentage of scheduled courses completed, by selected persistence factors and by whether or not they participated in the ACM academic advising system, of undergraduate students enrolled in a four-year public university in the South.

5. To determine the correct model fit to explain a significant proportion of the variance in student persistence as measured by whether or not the student was enrolled on the 14th class day of the semester following the semester of the investigation and by participating in early registration for the following fall semester, by selected persistence factors and by whether or not they participated in the ACM academic advising system, of undergraduate students enrolled in a four-year public university in the South.
**Objective 1 Results**

The first objective was to get a first look at the data by describing undergraduate students enrolled in a four-year public university in the South by whether or not they participated in the ACM academic advising system on age, gender, race, and by selected academic, personal, and financial persistence factors.

Since the study group was not a randomly drawn sample from the larger population where the study took place, it was necessary to investigate whether or not the profile of the sample was similar in composition to the larger population (all beginning freshmen for the fall 2006 semester) on characteristics for which data was collected for both groups. The university’s Office of Institutional Effectiveness (2006) published a profile booklet which contained limited demographic data for ethnicity, gender, age, living arrangements, average ACT Composite, and number of hours enrolled for the beginning freshmen in the fall 2006 semester. The demographic profile of the study participants was considered to be similar to the fall 2006 entering freshman class. The sample profile for gender mirrored that of the university population, with the study group comprised of 58.9% female (n = 152) and 41.1% male (n = 106) students, compared to university composites of 60.1% female and 39.9% male students. Living arrangements for the students were described by the university profile as either “On-campus” or “Off-campus.” The study sample was grouped accordingly for this comparison. The university data showed that 43.3% of entering freshmen resided in campus housing, with 56.7% living “Off-campus.” The study sample had similar findings with 37.3% of the students living “On-campus” (n = 91), and 62.7% (n = 153) having living arrangement “Off-campus.” The mean ACT composite for incoming freshmen, university-wide was 21.1 (no SD reported), as compared to the mean for the study group of 20.2 (SD = 2.87). The mean number of hours
enrolled for all beginning freshmen was 15.5 (no SD reported), with the study participants having a mean of 15.1 (SD = 2.33). Table 3 shows the percentage comparisons of the demographics reported for the university population and those for the study sample for age. Ages of students in the sample group were categorized the same as those used for the university’s profile report for Table 3.

Table 3
Age profile for the university freshman population in the fall of 2006 and the study sample of those students enrolled in selected freshman seminar class sections

<table>
<thead>
<tr>
<th>Age Category</th>
<th>University %</th>
<th>Study Sample %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Younger than 25</td>
<td>99.3</td>
<td>100</td>
</tr>
<tr>
<td>25 years of age and older</td>
<td>.7</td>
<td>0</td>
</tr>
</tbody>
</table>

Total Percent 100 100

Note: The mean age for the university population was 18.3 (no SD reported), with the study group mean of 18.5 (SD = 1.05).

Ethnicity was the demographic which had the greatest differences between the university’s freshman population and the study participants. The study participants reported fewer “White” students (n = 146, 57.5%), “Hispanic” students (n = 3, 1.2%), and those who marked “Other” (n = 6, 2.4%) than the university profile of entering students. The study participants had a greater percentage of Black (n = 95, 37.4%) and Asian students (n = 4, 1.6%) than did the university’s entering freshman class. The starkest contrast was for the white and black students. The percentage of white students who registered for the freshman seminar class was lower in comparison to the university population of entering freshmen, and the percentage of black who registered for the class was higher in comparison to the university population (Table 4).
Table 4
Ethnicity profile for the university freshman population in the fall of 2006 and the study sample of those students enrolled in selected freshman seminar class sections

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>University %</th>
<th>Study Sample %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asian</td>
<td>1.1</td>
<td>1.6</td>
</tr>
<tr>
<td>Black</td>
<td>18.7</td>
<td>37.4</td>
</tr>
<tr>
<td>Hispanic</td>
<td>2.3</td>
<td>1.2</td>
</tr>
<tr>
<td>White</td>
<td>74.0</td>
<td>57.5</td>
</tr>
<tr>
<td>Other</td>
<td>3.9</td>
<td>2.4</td>
</tr>
</tbody>
</table>

The design of the study warrants an initial description of the class counts by section, by instructor, group type (ACM or control group), for both initial and final class counts. There were a total of 258 participants in the ACM study, with 131 students enrolled in the ACM (treatment) group (six sections of the freshman seminar course) and 127 in the control group (also six sections of the course). Each of the 12 sections was filled to capacity at the semester’s onset (25 students enrolled in each section). There were 42 students who never attended and withdrew from the course before the 14th day class counts; thus were not included in the initial participant count. There were 12 sections, three instructors (each having two treatment and two control groups), and three periods of data collection across the fall 2006 semester: 1) CCTDI® pre-test and persistence factors questionnaire, administered on September 11th (for Monday/Wednesday/Friday sections) and September 12th (for Tuesday/Thursday sections), 2) ACM quiz, September 25th and 26th, and 3) CCTDI® post-test, administered on November 27th and 28th. To account for mortality, the three data collection periods were used for determining experimental mortality.
The first data collection period was the first meeting of the study, which included the persistence factors questionnaire (for all sections) and the CCTDI® pre-test (for six of the sections; three from the treatment group and three from the control group). Table 5 shows differential mortality for groups 10 and 16 (both control groups); the other sections showed non-differential mortality. Course instructors were asked to comment on absenteeism. The instructor for sections 10 and 16 reported that sporadic absenteeism for those sections were similar to the other sections. Section 10 was at 8:00 am on Tuesday and Thursday and section 16 was on Tuesday and Thursday at 12:30 pm. Both sections were one hour and 15 minutes classes. Instructors reported poorer attendance in the 8:00 am classes, which may account for the attrition in section 10. Section 2 was an 8:00 am class held on Monday, Wednesday and Friday, and showed a loss of five students. Sections 2, 6, 11, 12, and 13 had a decline in student counts between the pre-test and the ACM quiz; the counts for the ACM quiz and the CCTDI® post-test were the same. Sections 5, 6, 7 and 8 showed attrition after the pre-test and again after the ACM quiz, and sections 4, 10, and 17 had the same counts at the first two measures, but showed reduced counts for the post-test. The students in section 16 were present for all three measurement dates, indicating no attrition. Overall, data was collected from 210 students at all three measurements, with 48 students missing either the ACM quiz or the CCTDI® post-test (table 5). Students may or may not have continued to attend class and participate in the ACM study activities, but data to attest to that is unreliable. The instructors of the course reported that it was highly possible for a student to enter the classroom unnoticed after attendance was checked, thus the student was marked absent for purposes of the study. Because of irregular attendance and weak attendance tracking mechanisms, mortality can only be addressed by the inclusion of measurements as described earlier (Table 5).
Table 5
Attendance counts, by section, instructor, and group type, on the days of data collection, and the total number attrited for 12 sections of the freshman seminar course during fall 2006

<table>
<thead>
<tr>
<th>Course Section</th>
<th>Inst. Code</th>
<th>Group Type</th>
<th>Student Counts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>CCTDI® Pre-test</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>ACM</td>
<td>22</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>ACM</td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>ACM</td>
<td>26</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td>C</td>
<td>17</td>
</tr>
<tr>
<td>7</td>
<td>3</td>
<td>C</td>
<td>22</td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td>C</td>
<td>24</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
<td>C</td>
<td>25</td>
</tr>
<tr>
<td>11</td>
<td>3</td>
<td>ACM</td>
<td>24</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>ACM</td>
<td>19</td>
</tr>
<tr>
<td>13</td>
<td>3</td>
<td>ACM</td>
<td>20</td>
</tr>
<tr>
<td>16</td>
<td>1</td>
<td>C</td>
<td>17</td>
</tr>
<tr>
<td>17</td>
<td>1</td>
<td>C</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>258</td>
</tr>
</tbody>
</table>

The demographic information for meeting Objective 1 was collected directly from the students, through completing the persistence factors questionnaire. There were certain persistence factors selected for inclusion in describing the data, based on related literature which identified the most common factors associated with student persistence. The remaining persistence factors were closely related to those included in the descriptive analysis, thus
inclusion in this section would have been somewhat redundant. For instance, “worry about paying monthly bills” included the response “responsible for monthly bill,” with the former being included as a predictor of persistence. The factors that were considered subsets and not included were used for discussion prompts as the students experienced the activities leading to the completion of the first page of the Academic Concept Map.

**Age:** Respondents were asked to enter their ages into the appropriate space on the persistence factors questionnaire. All 258 of the participants responded to this item. Overall, the age group with the greatest number of participants was the 18 year olds (n = 164, 63.6%). The age group of 19 had the next highest response count (n = 55, 21.3%). Ages of the students ranged from 17 to 24, with 91.8% of the respondents between 18 and 20. Out of the 131 students in the treatment (ACM) group, ages ranged from 17 to 21, with most of the students 18 years old (n = 89, 67.9%). The mean age for the ACM group was 18.3, with a standard deviation of .750. The study group was positively skewed (1.354), and leptokurtotic (2.068). The large percentages of 18 and 19 year olds accounted for the symmetry values. There were no students in the ACM group older than 21, and it had more students who were 17 years old (n = 6, 4.6%). The control group, with 127 students, had an age range from 17 to 24. That group had seven students who were 22 and older (5.5%), but with only one student who was 17 years old (.8%). The mean age of the control group was 18.7, with a standard deviation of 1.261. Symmetry values were also noteworthy, with skewness at 2.192 and a large kurtosis value of 5.132 (Table 6).

**Table 6**

Ages of students enrolled in the selected sections of a freshman seminar course

<table>
<thead>
<tr>
<th>Age of Student</th>
<th>ACM Group</th>
<th>Control Group</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>17 years</td>
<td>6</td>
<td>4.6</td>
<td>1</td>
</tr>
</tbody>
</table>
(table cont.)

<table>
<thead>
<tr>
<th>Gender</th>
<th>18 years</th>
<th>19 years</th>
<th>20 years</th>
<th>21 years</th>
<th>22 years</th>
<th>23 years</th>
<th>24 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>89</td>
<td>67.9</td>
<td>75</td>
<td>59.1</td>
<td>164</td>
<td>63.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>18.3</td>
<td>31</td>
<td>24.4</td>
<td>55</td>
<td>21.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>7.6</td>
<td>8</td>
<td>6.3</td>
<td>18</td>
<td>7.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1.5</td>
<td>5</td>
<td>3.9</td>
<td>7</td>
<td>2.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>--</td>
<td>4</td>
<td>3.1</td>
<td>4</td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>--</td>
<td>1</td>
<td>.8</td>
<td>1</td>
<td>.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>--</td>
<td>2</td>
<td>1.6</td>
<td>2</td>
<td>.8</td>
<td></td>
</tr>
</tbody>
</table>

| Total  | 131      | 100      | 127      | 100      | 258      | 100      |

Note: Mean age for the treatment group was 18.3 (SD=0.750) and the mean age for the control group was 18.7 (SD=1.261).

**Gender:** The second variable on which study participants were described was gender. All of the study participants responded to this variable. The larger group (n = 152, 58.9%) of the students participating in the study responded that their gender was “female.” The remainder of the students (n = 106, 41.1%) reported their gender as “male.” The ACM group had almost twice as many females in the class sections as males. A total of 83 students reported “female” for gender (63.4%) and 48 reported “male” (36.6%). The control group was a little more balanced for this variable. There were 69 students who reported “female” for gender (54.3%) as compared to 58 who reported “male” (45.7%).

**Ethnicity:** Respondents were also described on the variable ethnicity. There were four cases of missing data for this factor (n = 254). The majority of respondents (n = 146, 57.5%) indicated that their ethnicity was “White.” Respondents who selected “Black” comprised the second largest group (n = 95, 37.4%). “Other” minority group responses comprised a small percentage of the study participants (n = 6, 2.4%). The ACM group had one case of missing
data, with 130 responses. The greatest number of responses for ethnicity was “White” (n = 80, 61.5%). None of the students in the ACM group chose “Hispanic” for ethnicity. The ACM and control groups were similar in the response of “Black” for ethnicity, with ACM having 47 (36.2%) and the control group having 48 (38.7%). Ten students in the control group reported ethnicity other than “Black” or “White” (7.9%) (Table 7).

Table 7
Ethnicity of students enrolled in the selected sections of a freshman seminar course

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>ACM Group</th>
<th></th>
<th></th>
<th>Control Group</th>
<th></th>
<th></th>
<th>Overall</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n^a</td>
<td>%^b</td>
<td></td>
<td>n^a</td>
<td>%^b</td>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Asian</td>
<td>2</td>
<td>1.5</td>
<td>2</td>
<td>1.6</td>
<td>4</td>
<td>1.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>47</td>
<td>36.2</td>
<td>48</td>
<td>38.7</td>
<td>95</td>
<td>37.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>0</td>
<td>--</td>
<td>3</td>
<td>2.4</td>
<td>3</td>
<td>1.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>80</td>
<td>61.5</td>
<td>66</td>
<td>53.2</td>
<td>146</td>
<td>57.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>.8</td>
<td>5</td>
<td>4.0</td>
<td>6</td>
<td>2.4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

^aFour study participants did not respond to this item (1 case for ACM, 3 for Control).
^bValid percent was calculated due to missing data.

Respondents were asked to report information about their daily hours of watching television, the number of nights they went out with friends for socializing, where they were currently living, how many hours they spend reading on a weekly basis, and the length of time they commuted to and from campus on a daily basis.

**Personal Persistence Factor – Television Viewing:** When asked how many hours of television they watched each day, the range of responses was from zero to 10 hours. Twenty of the study participants did not respond to this item (n = 238, 7.8%). The majority of the students
responded that they watched television for two hours each day ($n = 66, 27.7\%$). Thirteen students reported that they did not watch television on a daily basis at all (5.5\%), and two students reported watching 10 hours of television on a daily basis (.8). The mean number of daily hours for watching television was 2.76 ($SD = 1.983$). The overall distribution of the data did not approximate a normal distribution, but had a positive skew (1.249) and was leptokurtotic (1.658). Students who reported watching 10 hours of television on a daily basis may have mistakenly reported weekly hours or may have included hours in front of a television including internet use and video games. Because students were asked to report an “average” number of daily hours of television, measurement error can only be a supposition. The mean number of daily hours watching television for students in the ACM group was 2.69 ($SD = 1.89$), while the mean for the control group was 2.83 ($SD = 2.0$). Symmetry for both groups was notable; skewness for the ACM group was 1.326, with kurtosis of 1.684. Skewness for the control group was 1.181, with kurtosis of 1.650. The range of hours for the ACM group was from zero hours each day to nine hours, with the control group having a range from zero to 10 hours of daily television viewing (Table 8).

Table 8
Hours of television viewing reported by students enrolled in the selected sections of a freshman seminar course

| Hours of Television Viewing | ACM Group | |
|----------------------------|-----------|
|                            | $n^a$     | $%^b$ | Control Group | $n^a$ | $%^b$ | Overall | $n$ | $\%$ |
|----------------------------|-----------|
| 0 hours                    | 4         | 3.3   | 9             | 7.8   | 13     | 5.5     |
| 1 hours                    | 32        | 26.2  | 23            | 19.8  | 55     | 23.1    |
| 2 hours                    | 34        | 27.9  | 32            | 27.6  | 66     | 27.7    |
| 3 hours                    | 21        | 17.2  | 15            | 12.9  | 36     | 15.1    |

(table cont.)
<table>
<thead>
<tr>
<th>Hours</th>
<th>ACM</th>
<th>SD</th>
<th>Control</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>14</td>
<td>11.5</td>
<td>15</td>
<td>12.9</td>
</tr>
<tr>
<td>5</td>
<td>7</td>
<td>5.7</td>
<td>12</td>
<td>10.3</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td>2.5</td>
<td>4</td>
<td>3.4</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>.8</td>
<td>0</td>
<td>--</td>
</tr>
<tr>
<td>8</td>
<td>5</td>
<td>4.1</td>
<td>4</td>
<td>3.4</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>.8</td>
<td>0</td>
<td>--</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
<td>--</td>
<td>2</td>
<td>1.7</td>
</tr>
<tr>
<td>Total</td>
<td>122</td>
<td>100</td>
<td>116</td>
<td>100</td>
</tr>
</tbody>
</table>

Note: The mean hours for watching television for the treatment group was 2.69 (SD=1.89) and the mean number of hours for the control group was 2.83 (SD=2.0).

Twenty study participants did not respond to this item (9 missing cases from the ACM group, 11 from the control group).

Valid percent was calculated due to missing data.

Personal Persistence Factor – Nights Out: The students were asked to report the number of nights they went out with friends each week for socializing activities. Responses ranged from zero to seven nights a week, with an overall mean of 4.69, and a standard deviation of 2.169. Overall, except for those students who socialized every night of the week, the data approximated a normal distribution, but somewhat platykurtotic. Symmetry value for skewness was -.411, with a kurtosis value of -1.016. The overall counts for the participants showed that students going out every night of the week for socializing had the greatest number of responses (n = 88, 34.1%). Nine of those who responded reported that they did not go out for socializing at all (3.5%). The ACM group mean for “nights out” was 4.66 (SD = 2.146), while the control group mean was 4.72 (SD = 2.201). Skewness of the distribution for the ACM group was -.334, but was slightly platykurtotic (-1.184). Symmetry values for the control group were skewness of -.493 and kurtosis of -.840. A large percent of the students in the ACM group reported that they
socialized every night of the week (n = 43, 35.2%), with only two students reporting that they do not go out at night for socializing at all (1.6%). The control group also had the largest response to “nights out” as every night of the week (n = 45, 38.8%). Seven students in the control group reported that they did not go out at night for socializing (6.0%) (Table 9).

Table 9
Nights out for socializing reported by students enrolled in the selected sections of a freshman seminar course

<table>
<thead>
<tr>
<th>Number of Nights Out Each Week For Socializing</th>
<th>ACM Group</th>
<th>Control Group</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%a</td>
<td>n</td>
</tr>
<tr>
<td>0</td>
<td>2</td>
<td>1.6</td>
<td>7</td>
</tr>
<tr>
<td>1</td>
<td>9</td>
<td>7.4</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>9.8</td>
<td>13</td>
</tr>
<tr>
<td>3</td>
<td>18</td>
<td>14.8</td>
<td>14</td>
</tr>
<tr>
<td>4</td>
<td>17</td>
<td>13.9</td>
<td>19</td>
</tr>
<tr>
<td>5</td>
<td>13</td>
<td>10.7</td>
<td>14</td>
</tr>
<tr>
<td>6</td>
<td>8</td>
<td>6.1</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>43</td>
<td>35.2</td>
<td>45</td>
</tr>
<tr>
<td>Total</td>
<td>122</td>
<td>100</td>
<td>116</td>
</tr>
</tbody>
</table>

Note: The mean for nights out for the treatment group was 4.66 (SD=2.146) and the mean for the control group was 4.72 (SD=2.201).

aTwenty study participants did not respond to this item (9 missing cases from ACM group, 11 from control group).

bValid percent was calculated due to missing data.

Personal Persistence Factor – Residence: The students were asked to respond to their current place of residence. All of the responses given (n = 244) fell into one of three categories
(there were 14 missing responses for this variable). The responses were recoded to designate the following categories as 1 = “living at home with family,” 2 = “living in on-campus housing”, or 3 = “living away from home in off-campus housing.” The residence category with the fewest responses was “living away from home in off-campus housing” (n = 61, 23.6%). Slightly more than one-third of the students in the study were still living at home with their families (n = 92, 37.7%). The descriptive analysis for the ACM group on the variable “residence” was closely aligned to the study group as a whole, and revealed that 34.4% (n = 42) of the students still live in the family home, with 21.3% (n = 26) of the students living off-campus in arrangements other than with family. The highest percentage of students in the ACM group lived in on-campus housing (dormitories or apartments). The control group showed the highest percentage of the students still living at home with families (n = 50, 41.0%) (Table 10).

Table 10
Residence reported by students enrolled in the selected sections of a freshman seminar course

<table>
<thead>
<tr>
<th>Residence Of Student</th>
<th>ACM Group</th>
<th>Control Group</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>nᵃ</td>
<td>%ᵇ</td>
<td>nᵃ</td>
</tr>
<tr>
<td>Living with Family</td>
<td>42</td>
<td>34.4</td>
<td>50</td>
</tr>
<tr>
<td>Living On-campus</td>
<td>54</td>
<td>44.3</td>
<td>37</td>
</tr>
<tr>
<td>Living Off-campus</td>
<td>26</td>
<td>21.3</td>
<td>35</td>
</tr>
<tr>
<td>Total</td>
<td>122</td>
<td>100</td>
<td>122</td>
</tr>
</tbody>
</table>

ᵃFourteen study participants did not respond to this item (9 missing from ACM group, 5 missing from control group).
ᵇValid percent was calculated due to missing data.

**Personal Persistence Factor – Commute Time:** The average length of the commute to and from campus for the respondents in the study was 14.03 minutes (SD = 18.321), calculated on
the responses of 244 students (14 missing responses). The broad range of time (from zero to 90 minutes), the large number of respondents who reported zero minutes of commute time (n = 101, 41.4%), and the large gap between minutes at the upper end of the minutes would account for the inordinate size of the standard deviation. The data for commute time was not normally distributed, with a positive skew of 1.315 and slightly leptokurtotic (1.057). The category with the greatest number of responses was “0” (n = 101, 41.4%). Only two students (.8%) reported a commute time of greater than one hour. For both the ACM (n = 57, 46.7%) and the control groups (n = 44, 36.1%), the largest response set was for “0” minutes of commute time. One student in each group reported commute times of over one hour (.8%) (Table 11). The mean commute time was 15.3 minutes (SD=18.159) for the control group and 12.8 minutes (SD=18.473) for the ACM group.

Table 11
Commute time reported by students enrolled in the selected sections of a freshman seminar course

<table>
<thead>
<tr>
<th>Minutes of Commute Time for Student</th>
<th>ACM Group</th>
<th></th>
<th>Control Group</th>
<th></th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>0</td>
<td>57</td>
<td>46.7%</td>
<td>44</td>
<td>36.1%</td>
<td>101</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>.8%</td>
<td>1</td>
<td>.8%</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>1.6%</td>
<td>4</td>
<td>3.3%</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>1.6%</td>
<td>4</td>
<td>3.3%</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>.8%</td>
<td>1</td>
<td>3.8%</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>9</td>
<td>7.4%</td>
<td>5</td>
<td>4.1%</td>
<td>14</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>.8%</td>
<td>1</td>
<td>3.8%</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>11</td>
<td>9.0%</td>
<td>11</td>
<td>9.0%</td>
<td>22</td>
</tr>
</tbody>
</table>

(table cont.)
### Personal Persistence Factor – Hours Reading

The number of hours spent reading on a weekly basis had a response from 238 of the study participants. There was a slight positive skew of the data (.787), with fairly normal kurtosis (.210). The mean hours read was 2.34, with a standard deviation of 1.895. Out of those who responded, the most frequent response was two hours of weekly reading (n = 56, 23.5%). Forty-three students reported that they did not read at all on a weekly basis (18.1%). The profile for the students in the ACM group reported more time spent reading. The mean for the treatment group was 2.41 (SD = 2.02), with the number of hours spent reading each week ranging from zero to nine. The data was approximately normally distributed.

### Table: Hours Reading on a Weekly Basis

<table>
<thead>
<tr>
<th>Minutes</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>60</th>
<th>75</th>
<th>90</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minutes</td>
<td>5</td>
<td>3</td>
<td>0</td>
<td>11</td>
<td>3</td>
<td>3</td>
<td>7</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Minutes</td>
<td>4.1</td>
<td>2.5</td>
<td>--</td>
<td>9.0</td>
<td>2.5</td>
<td>--</td>
<td>5.7</td>
<td>.8</td>
<td>3.3</td>
<td>--</td>
<td>.8</td>
</tr>
<tr>
<td>Minutes</td>
<td>10</td>
<td>5</td>
<td>3</td>
<td>11</td>
<td>3</td>
<td>0</td>
<td>14</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Minutes</td>
<td>8.2</td>
<td>4.1</td>
<td>2.5</td>
<td>9.0</td>
<td>2.5</td>
<td>--</td>
<td>11.5</td>
<td>.8</td>
<td>2.5</td>
<td>--</td>
<td>.8</td>
</tr>
<tr>
<td>Minutes</td>
<td>15</td>
<td>8</td>
<td>3</td>
<td>22</td>
<td>6</td>
<td>3</td>
<td>21</td>
<td>2</td>
<td>7</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Minutes</td>
<td>6.1</td>
<td>3.2</td>
<td>1.2</td>
<td>9.0</td>
<td>2.5</td>
<td>1.2</td>
<td>8.6</td>
<td>.8</td>
<td>2.9</td>
<td>.4</td>
<td>.4</td>
</tr>
<tr>
<td>Total</td>
<td>122</td>
<td>100</td>
<td>122</td>
<td>100</td>
<td>244</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The mean number of minutes of commute time for the treatment group was 12.8 SD=18.473) and the mean for the control group was 15.3 (SD=18.159).

*Fourteen study participants did not respond to this item (9 missing cases from the ACM group, 5 missing from the control group).

*Valid percent was calculated due to missing data.
distributed, with a slight positive skew of .807, and a non-remarkable kurtosis value (.113). The control group had a mean number of hours spent reading of 2.26 (SD = 1.76), with the range of hours from zero to eight. Symmetry values for the control group data were similar to those of the ACM group (skewness = .717; kurtosis = .212). Over 50% of the students in both groups reported reading two hours or less each week. There were 21 (17.2%) students in the ACM group and 22 (19%) students in the control group who reported that they did not read at all during the week (Table 12).

Table 12
Weekly hours spent reading as reported by students enrolled in the selected sections of a freshman seminar course

<table>
<thead>
<tr>
<th>Number of Hours Reading per Week</th>
<th>ACM Group</th>
<th>Control Group</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n^a</td>
<td>%^b</td>
<td>n^a</td>
</tr>
<tr>
<td>0</td>
<td>21</td>
<td>17.2</td>
<td>22</td>
</tr>
<tr>
<td>1</td>
<td>31</td>
<td>25.4</td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>19</td>
<td>15.6</td>
<td>37</td>
</tr>
<tr>
<td>3</td>
<td>18</td>
<td>14.8</td>
<td>17</td>
</tr>
<tr>
<td>4</td>
<td>10</td>
<td>8.2</td>
<td>6</td>
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<td>11.5</td>
<td>14</td>
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<td>5</td>
<td>4.1</td>
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<tr>
<td>7</td>
<td>2</td>
<td>1.6</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>.8</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>.8</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>122</td>
<td>100</td>
<td>116</td>
</tr>
</tbody>
</table>

(table cont.)
Note: The mean hours of reading for the treatment group was 2.41 (SD=2.02) and the mean for the control group was 2.26 (SD=1.76).

Twenty study participants did not respond to this item (9 missing cases from the ACM group, 11 missing from the control group).

Valid percent was calculated due to missing data.

**Academic Persistence Factor – ACT Composite**: The ACT composite scores for the participants in the study ranged from 13 (only one student) to 33 (also only one student), with the mean ACT composite of 20.18, with a standard deviation of 2.866. Students were asked to provide ACT information on the persistence factors questionnaire. The researcher checked the ACT information for accuracy using the university’s student record system. There were no missing data for this factor, since that information was retrieved by the researcher if the student did not respond to the item. The overall distribution of the data had a positive skew (1.074) and was leptokurtotic (2.334). Most of the composite scores were clustered between 17 and 22. The extreme scores were <1% (13 and 33 ACT composite, each comprised .4% of the scores). The mean ACT composite for the treatment group was 20.5 (SD = 3.211), had a positive skew (1.294) and was leptokurtotic (2.068). Even though this group had higher scores reported than the control group, there were still 43.5% (n = 20) of the scores below the mean. The ACT composite scores in the ACM group ranged from 16 to 33, with the score of 20 most often reported (n = 24, 18.3%). The ACT composite scores for the control group ranged from 13 to 27, with 43.3% (n = 20) of the scores below the mean (19.9, SD = 2.439), and the most frequent score reported was also a 20. The shape of the distribution was fairly normal, with a skewness value of .274 and kurtosis of .650. The distribution for both groups was similar, but with a slight peak for the control group at a 23 composite score; 10 students reporting compared to the ACM group with only 3. There were 112 students in the study who admitted on conditions, meaning the ACT composite was below the cut-off of 20 (Table 13).
Table 13
ACT Composite scores for students enrolled in the selected sections of a freshman seminar course

<table>
<thead>
<tr>
<th>ACT Composite Score</th>
<th>ACM Group</th>
<th></th>
<th>Control Group</th>
<th></th>
<th>Overall</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>13</td>
<td>0</td>
<td>--</td>
<td>1</td>
<td>.8</td>
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<td>.4</td>
</tr>
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<td>15</td>
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<td>4</td>
<td>1.6</td>
</tr>
<tr>
<td>16</td>
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<td>.8</td>
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<td>3.1</td>
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<td>.8</td>
<td>4</td>
<td>1.6</td>
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<td>--</td>
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<td>.4</td>
</tr>
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<td></td>
<td>131</td>
<td>100</td>
<td>127</td>
<td>100</td>
<td>258</td>
<td>100</td>
</tr>
</tbody>
</table>

Note: The mean ACT Composite Score for the treatment group was 20.5 ($SD=3.211$) and the mean for the control group was 19.9 ($SD=2.439$).
**Academic Persistence Factor – Hours Enrolled:** Study participants enrolled for the fall 2006 semester registered for course loads ranging from six credit hours to 19 credit hours. Students were asked to provide the number of hours they were enrolled for the semester on the persistence factors questionnaire, but data was checked for accuracy using the university’s student record system, or retrieved in with cases of missing data. Hours of enrollment ranged from six to 19, with less than 12 hours considered part-time status. The mean number of hours enrolled for all students was 15.10, with a standard deviation of 2.332. The mean number of hours enrolled for the control group was 14.66, with a standard deviation of 2.501, with a negative skew (-1.313) and leptokurtotic (2.513). The ACM group had a mean number of hours of 15.53, with a standard deviation of 2.077, with data having a positive skew (2.077) and leptokurtotic (2.068). The overall distribution of the data for hours enrolled was negatively skewed (-1.257) and leptokurtotic (2.806). The largest response set was for 16 hours of enrollment (n = 86, 33.3%), with clustering around 15 to 17 hours of enrollment. There were 10 students who were enrolled on a part-time basis (fewer than 12 hours). Only two students (1.6%) in the ACM group were enrolled in less than 12 hours (full-time status) compared to eight students (6.4%) in the control group (Table 14).

Table 14

<table>
<thead>
<tr>
<th>Number of Hours Enrolled</th>
<th>ACM Group</th>
<th>Control Group</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>.8</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>0</td>
<td>--</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>0</td>
<td>--</td>
<td>2</td>
</tr>
</tbody>
</table>

(figure not available for Table 14 cont.)
<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>1</td>
<td>.8</td>
<td>2</td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>9.2</td>
<td>10</td>
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<tr>
<td>13</td>
<td>10</td>
<td>7.6</td>
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<tr>
<td>14</td>
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<td>3.8</td>
<td>4</td>
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<tr>
<td>15</td>
<td>21</td>
<td>16.0</td>
<td>20</td>
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<tr>
<td>16</td>
<td>44</td>
<td>33.6</td>
<td>42</td>
</tr>
<tr>
<td>17</td>
<td>19</td>
<td>14.5</td>
<td>11</td>
</tr>
<tr>
<td>18</td>
<td>10</td>
<td>7.6</td>
<td>6</td>
</tr>
<tr>
<td>19</td>
<td>8</td>
<td>6.1</td>
<td>3</td>
</tr>
</tbody>
</table>

| Total | 131 | 100 | 127 | 100 | 258 | 100 |

Note: The mean number of hours enrolled for the treatment group was 15.53 (SD=2.077) and the mean number of hours enrolled for the control group was 14.66 (SD=2.501).

**Academic Persistence Factor – Study Skills:** Students were asked to rate their study skills from 1 to 3, with 3 = “excellent study skills,” 2 = “good study skills,” and 1 = “study skills need improvement.” Twenty students did not respond to the item. The rating with the largest number of responses was 2 (n = 116, 48.7%), with 3 (excellent) having the fewest responses (n = 26, 10.9%). There were 96 students who rated themselves as needing to improve their study skills (40.3%). The students in the ACM group rated themselves as having better study skills than did the students in the control group. There were 16 students (13.1%) in the ACM group who rated their study skills as “excellent,” 60 (49.2%) who rated their skills as “good,” and 46 (37.7%) who rated their study skills as “needing improvement.” The control group had fewer in the “excellent” (n = 10, 8.6%) and “good” (n = 56, 48.3) categories, and had 43.1% (n = 50) who rated their study skills as “needing improvement.”
**Academic Persistence Factor – Parent’s College Graduation:** The questionnaire allowed for students to select one of four options for parent’s level of education, as measured by college graduation; 1 = “mother graduated from college,” 2 = “father graduated from college,” 3 = “both parents graduated from college,” and 4 = “neither parent graduated from college.” Out of the 258 participants, 238 responded to this item. Overall, more than half of the students reported that neither parent had graduated from college (n = 149, 62.6%). The ACM group had a higher frequency of reporting “mother only” (n = 10, 8.2) than did the control group (n = 3, 2.6). The other responses had a one count difference for the two groups (Table 15).

<table>
<thead>
<tr>
<th>Parent’s College Graduation</th>
<th>ACM Group</th>
<th>Control Group</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Mother only graduated</td>
<td>10</td>
<td>8.2</td>
<td>3</td>
</tr>
<tr>
<td>Father only graduated</td>
<td>5</td>
<td>4.1</td>
<td>6</td>
</tr>
<tr>
<td>Both parents graduated</td>
<td>32</td>
<td>26.2</td>
<td>33</td>
</tr>
<tr>
<td>Neither parent graduated</td>
<td>75</td>
<td>61.5</td>
<td>74</td>
</tr>
<tr>
<td>Total</td>
<td>122</td>
<td>100</td>
<td>116</td>
</tr>
</tbody>
</table>

*Twenty study participants did not respond to this item (9 missing from the ACM group, 11 missing from control group).

*Valid percent was calculated due to missing data.

**Financial Persistence Factors – Source of Financial Provisions:** There were six categories of responses from which a student could select for this item on the questionnaire. They were instructed to select the category that reflected the greatest contribution of financial provisions. The categories of choice were 1 = “TOPS (Tuition Opportunity Program for Students),” 2 =
“Loans,” 3 = “Grants,” 4 = “Parents,” and 5 = “Self.” For students who checked more than one source as primary, a sixth category “Combination” was included. There were 240 responses. More students in sections 5 (n = 6, 25%) and 12 (n = 4, 20%) reported that TOPS was the primary source of college funding. The control group’s “combination” category (n = 103, 87.3%) was greater than that category for the ACM group (n = 89, 73.0%). The ACM group had more students who reported “TOPS” as a primary funding source (n = 17, 13.9%) as compared to the control group (n = 3, 2.5%). As a whole, 80% of the students reported receiving funding from a combination of TOPS, loans and grants (n = 192). There were only four students, two in the ACM group (1.6%) and two in the control group (1.7%) who attributed primary funding to parents for college costs (1.7%). The same numbers and percentages applied to students who reported “self” as the primary funding source for paying for college (Table 16).

Table 16
Primary funding source for college costs for students in the selected sections of a freshman seminar course

<table>
<thead>
<tr>
<th>Primary Source Of Funding for College Costs</th>
<th>ACM Group</th>
<th></th>
<th>Control Group</th>
<th></th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n(^a)</td>
<td>(%(^b)</td>
<td>n(^a)</td>
<td>(%(^b)</td>
<td>n</td>
</tr>
<tr>
<td>Combination</td>
<td>89</td>
<td>73.0</td>
<td>103</td>
<td>87.3</td>
<td>192</td>
</tr>
<tr>
<td>TOPS</td>
<td>17</td>
<td>13.9</td>
<td>3</td>
<td>2.5</td>
<td>20</td>
</tr>
<tr>
<td>Grants</td>
<td>11</td>
<td>9.0</td>
<td>5</td>
<td>4.2</td>
<td>16</td>
</tr>
<tr>
<td>Parents</td>
<td>2</td>
<td>1.6</td>
<td>2</td>
<td>1.7</td>
<td>4</td>
</tr>
<tr>
<td>Self</td>
<td>2</td>
<td>1.6</td>
<td>2</td>
<td>1.7</td>
<td>4</td>
</tr>
<tr>
<td>Loans</td>
<td>1</td>
<td>.8</td>
<td>3</td>
<td>2.5</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>122</td>
<td>100</td>
<td>118</td>
<td>100</td>
<td>240</td>
</tr>
</tbody>
</table>
Eighteen study participants did not respond to this item (9 missing responses from each of the groups).

Valid percent was calculated due to missing data.

Financial Persistence Factor – Work Hours: For this item on the persistence factors questionnaire, students were asked to enter the number of hours they worked on a weekly basis. A total of 243 students responded to the question, with an overall mean of 13.71 and a standard deviation of 13.01. The shape of the data showed a slight skew (.361) and platykurtosis (-1.13).

The number of weekly work hours most often reported by the participants was “zero” (n = 94, 38.7%). The category with the second highest number of hours reported was “20 hours” (n = 45, 18.5%). Twelve students in the study reported working 40 hours each week (4.9%). The mean number of hours worked for the ACM group was 12.68 (SD = 12.418), with a slight positive skew in the distribution of the data (.369) and negative kurtosis (-1.122). The control group had a mean number of hours worked of 14.75 (SD = 13.559). The distribution of the data was similar to the ACM group with a skewness value of .325 and negative kurtosis (-1.195). For both of the groups, for those students who reported that they did work on a weekly basis, 20 was the number of hours most often reported (ACM group, 21.3% and control group, 15.7%) Nine students (7.4%) in the control group reported that they worked 40 hours each week (Table 17).

Table 17
Weekly work hours for students in the selected sections of a freshman seminar course

<table>
<thead>
<tr>
<th>Number of Hours Worked on a Weekly Basis</th>
<th>ACM Group</th>
<th>Control Group</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n^a</td>
<td>%^b</td>
<td>n^a</td>
</tr>
<tr>
<td>0</td>
<td>51</td>
<td>41.8</td>
<td>43</td>
</tr>
<tr>
<td>3</td>
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<td>.8</td>
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<td>0</td>
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<tr>
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<td>8</td>
<td>6.6</td>
<td>4</td>
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<tr>
<td>16</td>
<td>1</td>
<td>.8</td>
<td>2</td>
</tr>
<tr>
<td>18</td>
<td>1</td>
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<td>0</td>
</tr>
<tr>
<td>20</td>
<td>26</td>
<td>21.3</td>
<td>19</td>
</tr>
<tr>
<td>21</td>
<td>1</td>
<td>.8</td>
<td>3</td>
</tr>
<tr>
<td>24</td>
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<td>3</td>
</tr>
<tr>
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<td>1</td>
</tr>
<tr>
<td>30</td>
<td>8</td>
<td>6.6</td>
<td>12</td>
</tr>
<tr>
<td>31</td>
<td>1</td>
<td>.8</td>
<td>0</td>
</tr>
<tr>
<td>32</td>
<td>0</td>
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<td>1</td>
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<tr>
<td>36</td>
<td>1</td>
<td>.8</td>
<td>0</td>
</tr>
</tbody>
</table>

(table cont.)
Note: The mean number of hours worked for the treatment group was 12.68 (SD=12.418) and the mean for the control group was 14.75 (SD=13.559).

a Fifteen study participants did not respond to this item (9 missing responses from the ACM group and 6 from the control group).

b Valid percent was calculated due to missing data.

**Financial Persistence Factor – Worry About Bills:** This particular question followed one that asked if the student had financial obligations for which he or she was responsible. If so, then the students were asked to respond to the following item which had to do with the level of worry that was caused by the financial responsibilities. For those students who had financial responsibilities, the responses about worry were either “no” (coded as “1”) or “yes” (coded as “2”). Overall, there were more students who reported that they worried about financial obligations (n = 166, 68.3%) than those who reported that they did not worry about paying any bills (n = 77, 31.7%). There were 15 students who did not respond to this item on the questionnaire. A larger percentage of the students in the ACM group worried about bills (n = 90, 73.8%) than did the control group (n = 76, 62.8%). There were nine students from both groups who did not respond to this item. The number of students from the ACM group who reported they did not worry about their bills was 32 (26.2%) as compared to 45 students (37.2%) in the control group.

**Objective 2 Results**

Determining whether or not the critical thinking activities imbedded within the ACM study were effective served as the purpose for the second objective. There were two measures associated with this objective. The researcher compared the propensity for incorporating critical
thinking skills, as measured by the California Critical Thinking Disposition Inventory (CCTDI®), and the ability to apply critical thinking skills to academic situations, as measured by the ACM quiz, among undergraduate students enrolled in a four-year public university in the South by whether or not they participated in the ACM academic advising system. The statistical procedures incorporated for analyzing the data for this objective were ANCOVA (for the CCTDI® pre and post-tests) and one-way ANOVA for measuring the effects of the ACM quiz.

Researchers at Penn State University defined the constructs of dispositional critical thinking on seven subscales. Using factor analysis, they reduced the original 150 questions to 75. Using Cronbach’s Alpha, reliability of the CCTDI® was 0.90 overall, with subscale reliability ranging from 0.72 - 0.80. Factor analytic methods revealed that there were seven non-orthogonal and non-discrete factors on which the 75 items loaded (CCTDI® Test Manual, 2000 update). The seven subscales included “Truth Seeking” (T), “Open-mindedness” (O), “Analyticity” (A), “Systematicity” (S), “Critical Thinking Self-confidence” (C), “Inquisitiveness” (I), and “Maturity of Judgment” (M). Each scale score ranges from 10 – 60, with the total CCTDI scores ranging from 70 to 420. For each of the scales, negative critical thinking disposition was indicated by scores of below 30 and positive critical thinking disposition was indicated by scores above 40. Overall critical thinking disposition scores of below 280 indicated a deficiency in critical thinking disposition, while overall scores above 350 revealed positive disposition for using critical thinking skills. The 75-item instrument, measuring participant responses on a 6-point Likert scale, with 1 = “agree strongly,” 2 = “agree,” 3 = “agree somewhat,” 4 = “disagree somewhat,” 5 = “disagree,” and 6 = “disagree strongly,” was given as a pre and post-test to students enrolled in selected sections of a freshman seminar course. A total of 328 observations were collected for analysis. Total and subscale measures of
central tendency, dispersion and percent of positive and negative disposition (based on cut-off scores established by the test developers) are listed in Table 18.

Table 18
Total and subscale mean, standard deviation, range and percentages of positive and negative disposition on the CCTDI® pre and post-tests

<table>
<thead>
<tr>
<th>Scale</th>
<th>Pre-Test Range Of Scores</th>
<th>M</th>
<th>SD</th>
<th>Percent Negative</th>
<th>Percent Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truth-Seeking</td>
<td>24-45</td>
<td>34.29</td>
<td>5.43</td>
<td>18.6</td>
<td>10.2</td>
</tr>
<tr>
<td>Open-mindedness</td>
<td>27-53</td>
<td>39.95</td>
<td>5.77</td>
<td>6.8</td>
<td>45.8</td>
</tr>
<tr>
<td>Analyticity</td>
<td>25-55</td>
<td>42.42</td>
<td>5.74</td>
<td>1.7</td>
<td>61.0</td>
</tr>
<tr>
<td>Systematicity</td>
<td>29-58</td>
<td>39.38</td>
<td>7.08</td>
<td>1.7</td>
<td>39.0</td>
</tr>
<tr>
<td>Confidence</td>
<td>28-60</td>
<td>42.24</td>
<td>6.97</td>
<td>1.7</td>
<td>55.2</td>
</tr>
<tr>
<td>In Critical Thinking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inquisitiveness</td>
<td>25-59</td>
<td>46.25</td>
<td>7.61</td>
<td>1.7</td>
<td>79.7</td>
</tr>
<tr>
<td>Maturity of Judgment</td>
<td>25-54</td>
<td>41.37</td>
<td>6.84</td>
<td>5.1</td>
<td>50.3</td>
</tr>
<tr>
<td>Total</td>
<td>226-348</td>
<td>285.38</td>
<td>29.68</td>
<td>44.8</td>
<td>0.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scale</th>
<th>Post-Test Range Of Scores</th>
<th>M</th>
<th>SD</th>
<th>Percent Negative</th>
<th>Percent Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truth-Seeking</td>
<td>18-45</td>
<td>32.78</td>
<td>6.29</td>
<td>29.4</td>
<td>12.7</td>
</tr>
<tr>
<td>Open-mindedness</td>
<td>25-53</td>
<td>38.58</td>
<td>5.77</td>
<td>3.9</td>
<td>37.3</td>
</tr>
<tr>
<td>Analyticity</td>
<td>29-57</td>
<td>41.93</td>
<td>6.02</td>
<td>1.0</td>
<td>58.8</td>
</tr>
<tr>
<td>Systematicity</td>
<td>25-59</td>
<td>37.81</td>
<td>6.20</td>
<td>6.9</td>
<td>31.4</td>
</tr>
<tr>
<td>Confidence</td>
<td>27-60</td>
<td>42.19</td>
<td>7.55</td>
<td>2.9</td>
<td>54.1</td>
</tr>
<tr>
<td>In Critical Thinking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inquisitiveness</td>
<td>29-60</td>
<td>43.59</td>
<td>7.28</td>
<td>1.0</td>
<td>59.8</td>
</tr>
</tbody>
</table>

(table cont.)
Note: Subscale negative disposition cut-off score of ≤ 30; positive disposition cut-off score of ≥ 40. For total scores, negative disposition cut-off of ≤ 280, and cut-off for positive disposition for critical thinking of ≥ 350 (cut-off values established by test developers).

Correlation analysis of the pre and post-test scores for this study revealed a relatively high association as expected ($r = .798$, $p < .001$), which added the necessary credibility to use the pre-test as a covariate. The overall descriptive statistics were derived for the data, which included measures of central tendency and dispersion, for both testing periods for the treatment and control groups. The mean scores of the CCTDI® had a greater difference for pre-test scores than for post-test scores for the treatment and control groups (Table 19).

Table 19
CCTDI® measures of central tendency and dispersion for pre and post-test scores and seven subscales

<table>
<thead>
<tr>
<th>Measurement</th>
<th>n</th>
<th>M</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>328</td>
<td>276.20</td>
<td>29.59</td>
<td>205-365</td>
</tr>
<tr>
<td>Treatment Group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CCTDI® Pre-test</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(sections 4, 5, and 11)</td>
<td>59</td>
<td>271.22</td>
<td>29.59</td>
<td>205-365</td>
</tr>
<tr>
<td>Truth</td>
<td>59</td>
<td>32.20</td>
<td>5.65</td>
<td>21-48</td>
</tr>
<tr>
<td>Open-mindedness</td>
<td>59</td>
<td>38.07</td>
<td>5.80</td>
<td>22-50</td>
</tr>
<tr>
<td>(table cont.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analyticity</td>
<td>59</td>
<td>41.81</td>
<td>5.94</td>
<td>32-60</td>
</tr>
<tr>
<td>Systematicity</td>
<td>59</td>
<td>36.92</td>
<td>8.08</td>
<td>18-60</td>
</tr>
<tr>
<td>CT Confidence</td>
<td>59</td>
<td>39.39</td>
<td>6.67</td>
<td>27-57</td>
</tr>
<tr>
<td>Inquisitiveness</td>
<td>59</td>
<td>42.58</td>
<td>6.84</td>
<td>27-57</td>
</tr>
<tr>
<td>Maturity</td>
<td>59</td>
<td>40.25</td>
<td>6.12</td>
<td>24-55</td>
</tr>
<tr>
<td>CCTDI® Post-test</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(sections 2, 12, and 13)</td>
<td>108</td>
<td>273.48</td>
<td>27.44</td>
<td>217-348</td>
</tr>
<tr>
<td>Truth</td>
<td>108</td>
<td>32.22</td>
<td>6.11</td>
<td>16-49</td>
</tr>
<tr>
<td>Open-mindedness</td>
<td>108</td>
<td>37.87</td>
<td>5.51</td>
<td>25-51</td>
</tr>
</tbody>
</table>
(table cont.)

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>
| Analyticity                    | 108 | 41.85 | 5.91| 30-60
| Systematicity                  | 108 | 37.54 | 6.94| 23-54
| CT Confidence                  | 108 | 41.24 | 6.94| 24-60
| Inquisitiveness                | 108 | 43.69 | 7.03| 28-60
| Maturity                       | 108 | 39.07 | 6.78| 20-57

Control Group

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>
| CCTDI® Pre-test                | 59  | 285.38| 29.68| 226-348
| (sections 7, 8, and 10)        |     |       |     |
| Truth                          | 59  | 34.29 | 5.43| 24-45
| Open-mindedness                | 59  | 39.95 | 5.77| 27-53
| Analyticity                    | 59  | 42.42 | 5.74| 25-55
| Systematicity                  | 59  | 39.37 | 7.08| 29-58
| CT Confidence                  | 59  | 42.24 | 6.97| 28-60
| Inquisitiveness                | 59  | 46.25 | 7.61| 25-59
| Maturity                       | 59  | 41.37 | 6.84| 25-54

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>
| CCTDI® Post-test               | 102 | 274.88| 30.36| 222-361
| (sections 6, 16, and 17)       |     |       |     |
| Truth                          | 102 | 32.78 | 6.29| 18-45
| Open-mindedness                | 102 | 38.58 | 5.77| 25-53
| Analyticity                    | 102 | 41.93 | 6.02| 29-57
| Systematicity                  | 102 | 37.81 | 6.20| 25-59
| CT Confidence                  | 102 | 42.20 | 7.55| 27-60
| Inquisitiveness                | 102 | 43.59 | 7.28| 29-60
| Maturity                       | 102 | 38.00 | 8.11| 16-58

Note: Solomon 4-group design was used as a model for the study.

After deriving general descriptions for the data, exploratory factor analysis was conducted using the 328 observations of CCTDI® scores. Factor analysis is a procedure that assumes linearity, and is easiest to interpret when data is interval level. Exploratory factor analysis determines the nature of the underlying factors and their relationships to the test items and with each other. That determination is all but impossible in a single study (Costello & Osborne, 2005). The process requires repeated studies, not just one very large sample. The process of refining the data involves not only repeated studies and analysis, but also recording the sample attributes that may influence the outcome. During the refining process, selecting
samples rather than randomly sampling can help to control and define certain factors, items may need to be added or removed from the instrument to build stability and solidity. Ordinarily, confirmatory factor analysis would be reserved for use involving standardized instruments after test developers clearly establish foundational hypotheses regarding the underlying structures and how well the items measured represent the principle factors. The process for establishing a solid set of hypotheses of the constructs and domains involved in the instrument requires a series of testing and exploratory factor analysis. A final run test administration should report the overall test modifications and at what point modifications were minimal. The final run should clearly define attributes of a population that reflect the factors. With that level of assurity, researchers interested in using the instrument for measuring the domains under consideration, should conduct confirmatory factor analysis, with a substantial amount of confidence in the validity and reliability of the test (Costello & Osborne, 2005). The CCTDI® test developers did not report test trials other than the Delphi Study and would not release information on item analysis for conducting confirmatory factor analysis. As was indicated, exploratory factor analysis was used for determining unidimensionality of the latent subgroups that existed for categorizing the 75 items included in the instrument.

There are multiple purposes for conducting exploratory factor analysis, specifically to reduce the data into a manageable set of variables for explaining the data set and to demonstrate that the indicator variables associated with a construct do indeed measure the same thing (Garson, 2007). When correlations exist for two variables, a third “factor” (construct) is sought to explain that association. Indicator variables should have higher factor loading values on the constructs for which they are associated than with the other constructs (principle factors). The procedure for factor analysis ultimately seeks the factors that explain, parsimoniously, the
correlations among the original variables. For the data set in the ACM study, the sample size was slightly less than adequate for a 5:1 ratio (Pedhazur, 1997), having 328 observations against the high number of instrument items ($n = 75$). The ratio of 4.4:1 should be noted by the reader. However, according to Garson (2005), 300 or more observations are adequate for exploratory factor analysis. The statistical assumptions include normality (due to correlation procedures), linearity, and homoscedasticity of the deviations. There should also be homogeneity of variance in the outcome scores for the respondents, as well as sound conceptual linkages for the variables included in the analysis (Hair, et al., 1995). A histogram of the residual scores for the CCTDI® pre and post-tests showed an approximately normal distribution, with skewness of .207 for the pre-test and .627 for the post-test, and kurtosis of -.197 for the pre-test and .038 for the post-test. Levene’s statistic for the two testing periods was .765 for the pre-test and .333 for the post-test. A probability plot of the expected against observed residuals for pre-test and post-test scores showed that linearity was not violated. Testing assumptions for conducting exploratory factor analysis (EFA) is exemplified in the degree to which the correlations of the variables are affected. For the data under consideration, there were no indications in the literature, or from reports by the test developers, that the item responses would or should be different for gender, ethnicity or age, as long as it was given to the same class of students (in the Delphi study, seniors and graduate students scored higher than freshmen), thus, it was determined that the data derived were homogenous for purposes of identifying underlying structures. To justify using exploratory factor analysis on a data set, several statistical values have to be considered: 1) there should be a substantial number of correlations that are $>.30$, 2) partial correlations should not be large values ($<.3$), which would mean that there are too few or no underlying factors that can explain the intercorrelations, 3) The Bartlett test of sphericity should indicate that there are
significant correlations among the variables, indicating that the data is more than likely factorable (Brace et al., 2003), and 4) the measure of sampling adequacy (MSA) should have high values (.5 and higher), indicating the degree of intercorrelations among the variables in the data set (Hair et al., 1995). For MSA, removing variables with values <.5 allows the researcher to more realistically determine the overall MSA. Correlation analysis for the 75 items on the CCTDI® showed weak correlations among the items, with only 32 (<1%) correlations above .3, and none higher than .399. Justification for using exploratory factor analysis was unsupported by initial view of item intercorrelations. Partial correlations on the anti-image matrix were small enough to indicate that a substantial proportion of the item variance was explained by other variables in the subset, though the item-to-item association was weak; thus the analysis was continued. Most of the residual values in the reproduced matrix (differences between the reproduced and observed correlations) were quite small (<.10), with only 1% of the absolute values of the residuals greater than .05, indicating that the data lends itself well to factor analysis. The Bartlett test of sphericity (approximate χ²) showed statistical significance (p <.001), indicating that using factor analysis was an appropriate technique for summarizing the data and detecting underlying structures that could explain variability among the original items. Bartlett’s test of sphericity analyzes whether or not the data set forms an identity matrix, which means that the data are unrelated (yields a coefficient of 1.0 on the diagonal of the matrix), that there are as many factors as there are items, and that factor analyzing the data is not appropriate. Significance (.05) means that the data are intercorrelated and appropriate for factor analysis. The MSA for the 75 items ranged from .455 to .889, with values below .5 considered undesirable for the inclusion in the analysis. The overall MSA for the data set, using Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy, was .775, indicating that roughly 78% of the variance
in the test items could be explained by underlying structures (factors). A parsimonious model seeks the fewest number of factors that will explain the greatest amount of variance in the test items. Twenty-four factors were extracted when the latent root criterion was set for eigenvalues at 1.0 and above, explaining approximately 64% of the variability among the original items, yielding an unparsimonious model. There were two variables with MSA values below .5; item #13, “Men and women are equally logical,” and item #5, “It’s never easy to decide between competing points of view.” In addition to MSA, small extracted communality values (<.3) indicate variables that are not a good fit with the factor solution and don’t add enough information to the solution. Consideration must be given to determine whether or not those variables should be retained in the analysis. The values for initial communalities represent the proportion of variance accounted for in each variable by the other variables in the data set, while the extracted communality values are estimates of the proportion of variance accounted for in each variable by the underlying extracted factors (Brace et al., 2003). Low initial and extracted communality values indicate that the item was not explained well by the other variables in the data set or by the extracted factors, thus the value added should be considered carefully through inspection of model changes with item removal. The extracted and initial communalities for “Men and women are equally logical” and “It’s never easy to decide between competing points of view,” as well as values for measures of sampling adequacy are shown in Table 20. The items were removed, one at a time, for inspecting model changes.

Table 20
<table>
<thead>
<tr>
<th>Removed Item</th>
<th>Item description</th>
<th>MSA</th>
<th>Initial Communalities</th>
<th>Extracted Communalities</th>
</tr>
</thead>
</table>

119
(table cont.)

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>KMO</th>
<th>Bartlett</th>
<th>Extracted factors</th>
<th>Initial variance</th>
<th>Extracted variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>#5</td>
<td>It's never easy to decide between competing points of view</td>
<td>.779</td>
<td>&lt;.001</td>
<td>23</td>
<td>62.849</td>
<td>46.583</td>
</tr>
<tr>
<td>#13</td>
<td>Men and women are equally logical</td>
<td>.778</td>
<td>&lt;.001</td>
<td>24</td>
<td>64.284</td>
<td>47.501</td>
</tr>
</tbody>
</table>

*Communality values above .3 are considered fair for inclusion, but the item was excluded from the analysis based on MSA value or extracted communality.

With the removal of item #5, the analysis was rerun. Careful attention was given to model improvement by noting the changes in KMO values, Bartlett’s test of sphericity, anti-image correlations (negatives of partial correlations), the number of factors extracted with eigenvalues at 1.0, and the variance explained by the extracted factors. Replacing item #5 and removing item #13, the analysis was run again for the same considerations. Removal of item #5 improved overall measures of sampling adequacy versus removal of item #13, which resulted in a decrease in overall measures of sampling adequacy (Table 21).

Table 21
Item removal from exploratory factor analysis and resulting values for KMO, Barlett’s test of sphericity, number of factors extracted, and total variance explained by the factors from the CCTDI®

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>KMO</th>
<th>Bartlett</th>
<th>Extracted factors</th>
<th>Initial variance</th>
<th>Extracted variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>#5</td>
<td>It's never easy to decide between competing points of view</td>
<td>.779</td>
<td>&lt;.001</td>
<td>23</td>
<td>62.849</td>
<td>46.583</td>
</tr>
<tr>
<td>#13</td>
<td>Men and women are equally logical</td>
<td>.778</td>
<td>&lt;.001</td>
<td>24</td>
<td>64.284</td>
<td>47.501</td>
</tr>
</tbody>
</table>

The total variance explained after the 23 factors were extracted (with item #5 removed) decreased by approximately 16%. There was a decrease in overall variance of approximately 17%, with 24 extracted factors, after removing item #13. After removing item #5, the initial and extracted communalities for the remaining items were negatively affected, but the values
improved after removal of item #13. Based on the overall lack of fit, it was the researcher’s decision to remove item #13, “Men and women are equally logical,” but to retain item #5 “It’s never easy to decide between competing points of view.”

The next major consideration for continuing the analysis was the large number of factors extracted. The low item-to-item correlations accounted for the large number of factors necessary to explain an adequate amount of the variance among the original items. Cattell’s scree plot of the eigenvalues did not concur with the extraction of the 23-24 factors used in the initial solution, showing only four to six factors above the break of the slope, with the sixth factor only slightly above the break (Figure 6).

![Scree Plot](image)

Figure 6. Cattell scree plot showing the decline and break in the slope for identifying the number of factors for inclusion in trials for exploratory factor analysis.

According to Garson (2007), many researchers simply use the rule of thumb of selecting the number of factors that will account for 90% of the variability of the items. For this data set, 52 factors were necessary for accounting for 90% of the variation (before computing eigenvalues on extracted sums of squares). When parsimony is the researcher’s goal, a 50% explanation is
acceptable. To account for 50% of the variance in this data set, 15 factors would have to be extracted. Often, with such a large number of items, suboptimization occurs if the items are too similar, and false factors may emerge (Garson, 2007). Key phrases and words in item descriptions can reveal suboptimization, with the real clue being that the researcher has a difficult task in identifying similarities and differences among the factor loading items.

Forcing cut-off for factor extraction at eigenvalues above 2.0, with item #13 removed, five factors were extracted explaining 30.044% of the variability before extraction and 25.192% after the factors were extracted (loss of approximately 5%). KMO and Bartlett’s test values were unchanged, but the extracted communalities were negatively affected. By reducing the number of factors, the variance among the original items was not explained to the same degree, which was to be expected due to low item intercorrelations. Cattell’s scree plot afforded a visual support for determining the most appropriate number of factors, revealing a sharp decline for three factors and a leveling in the slope after six factors. With a priori for factor analysis and knowledge of factor loadings, stepwise strategies can reveal the most valid number of factors for a new data set. According to Hair et al. (1995), the trials in deriving the best combination of variables and deciding on the number of factors to extract is similar to focusing a microscope. It is often necessary for the researcher to begin with an idea for latent root criterion, adjusting around that value until the best solution is derived. The CCTDI® test developers reported that the original factor analysis resulted in forced loadings on seven non-orthogonal, non-discrete factors, but since item face validity and item loading information was not provided by the test developers for conducting stepwise analysis, extracting seven factors had no sound basis for trial analysis other than serving as a possible maximum. The researcher determined that the most appropriate criterion for selecting the number of factors for the immediate data was the visual
support of the Cattell scree plot. Table 22 shows the impact on the model when forcing cut-off for extraction on three through seven factors.

Table 22
Forced cut-off for extracting from three to seven factors and the impact on model value for the CCTDI®

<table>
<thead>
<tr>
<th>Number of factors extracted</th>
<th>Range of extracted communalities</th>
<th>Percent initial variance</th>
<th>Percent extracted variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>.026 - .451</td>
<td>23.742</td>
<td>20.718</td>
</tr>
<tr>
<td>4</td>
<td>.032 - .468</td>
<td>27.091</td>
<td>23.100</td>
</tr>
<tr>
<td>5</td>
<td>.049 - .484</td>
<td>30.044</td>
<td>25.192</td>
</tr>
<tr>
<td>6</td>
<td>.061 - .487</td>
<td>32.734</td>
<td>26.999</td>
</tr>
<tr>
<td>7</td>
<td>.079 - .505</td>
<td>35.109</td>
<td>28.506</td>
</tr>
</tbody>
</table>

The values generated for extracting three through seven factors was not remarkably different, but with the largest “jump” in the percent of variance explained between three and four factors. None of the trials did a good job of explaining a large amount of the variability among the original instrument items. To make a decision on the number of factors to extract for continuing the analysis, factor loadings and cross-loadings were considered. Table 23 shows the number of differentiated loadings on the number of factors extracted per trial. For determining the structure of a model, a structure matrix was generated to reveal whether there was model interpretability. Simple structure is desirable, with items loading highly on one structure, with values of .4 and higher. Items that load at or close to that value on two or more structures are cross-loadings and, with too many, interpretability is lost. Costello and Osborne (2005) state that
a good value, for determining item inclusion on an extracted factor, is .32, with cross-loading considered if an item loads closely at that level or above on more than one factor.

Table 23
Factor loadings from a structure matrix for extracting three through seven factors for the CCTDI®

<table>
<thead>
<tr>
<th>Number of factors extracted</th>
<th>Number of items loadings on each extracted factor</th>
<th>Cross-loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>17 13 7 - - - -</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>17 17 10 4 - - -</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>10 15 6 3 3 - -</td>
<td>13</td>
</tr>
<tr>
<td>6</td>
<td>15 8 9 5 5 4 -</td>
<td>12</td>
</tr>
<tr>
<td>7</td>
<td>14 8 7 6 3 4 2</td>
<td>14</td>
</tr>
</tbody>
</table>

As shown in table 26, the dispersion of the loadings expands to fit the factors, showing a problem with overfactoring for the models with four or more extracted factors (not enough items loading on each of the factors). The three-factor model resulted in a better profile of the factor loadings, with fewer cross-loadings than did the other models. The number of loadings decreased from the first to the last factor for all models, with the seven-factor model showing only two loadings for the last factor, which did not fit with a parsimonious model. Even though the initial variance explained by the three-factor model was much lower, the percentage after rotation (20.72%) was only 7.8% less than that of the seven-factor model. With such low percentages of variance explained across all trials, it seemed negligible to expand the data to fit more than three factors for such a low gain. Factor correlation matrices helped in making the final decision for latent root criterion. Factors that have high correlation coefficients (> .6) reflect
the intercorrelated nature of the underlying, multifaceted dimensions of the variables associated with the propensity for critical thinking among college students. Smaller correlations indicate that the factors were discrete and that the instrument items did not adequately represent the interrelationships of the psychological constructs inherent in the items. Correlations for all of the models were moderate to low, with coefficients <.5. After scrutiny of the data, and acknowledgement that the low initial intercorrelations of CDTI® original items did not clearly define a useful model, it was determined that the three-factor model was adequate for continuing the analysis and explaining a significant amount of the variability in the original test items.

The 74 ordinal-level items (#13 removed) measured on the CDTI® (Likert-type scale) were analyzed using principle axis factoring with promax rotation, due to the non-orthogonal relationships among the variables. To address missing data using Likert-type scales, the mean for the scale is substituted to retain all cases in the analysis. For this data set, there were no missing responses, thus all 328 cases were retained. The indicators of factorability (MSA, partial correlations, residual values, Bartlett test of sphericity) were adequate for running the analysis. The decision was made to continue using the latent root criterion of three factors, which together explained 23.7% of the variance in the original items, with eigenvalues >3.0 (Table 24).

Table 24
Eigenvalues for the three extracted factors and the amount of variance explained, showing the initial solution and eigenvalues after rotation for the items measured on the CDTI®

<table>
<thead>
<tr>
<th>Factor</th>
<th>Eigenvalues</th>
<th>% Variance</th>
<th>Cumulative %</th>
<th>Rotation</th>
</tr>
</thead>
<tbody>
<tr>
<td>(table cont.)</td>
<td>8.452</td>
<td>11.422</td>
<td>11.422</td>
<td>6.134</td>
</tr>
<tr>
<td>1</td>
<td>6.014</td>
<td>8.127</td>
<td>19.549</td>
<td>6.504</td>
</tr>
<tr>
<td>2</td>
<td>3.103</td>
<td>4.193</td>
<td>23.742</td>
<td>4.695</td>
</tr>
</tbody>
</table>

125
Promax, or oblique rotation, was used to better understand the factor loadings, as unrotated values can be hard to interpret. Promax is the method of choice when data are non-orthogonal. Even though the correlations for the data were quite low, there were enough to warrant using this rotation method. Oblique rotations allow for the loadings to rotate around the axes until the principle factors were clearly defined by the differentiated factor loadings. Rotations generate both pattern and structure matrices, with the pattern matrix explaining the factor loadings based on the unique contributions for each measured variable and the structure matrix explaining the correlations between a measured variable and the corresponding extracted factor, including unique and common variance. Both matrices are useful in model interpretation, with individual factor loadings the basis for imputing factor labels (Garson, 2007). Careful inspection of both matrices led to the determination that 17 items with differentiated loadings formed factor one (with one cross-loaded item), 13 items formed factor two (with four cross-loaded items), seven items formed factor three (with one cross-loaded item). There were no items that cross-loaded on all three factors. The coefficients in Table 25 are factor loadings, and the imputed labels for the factors are induced from the variables with the highest loadings on a given factor. This is a subjective process, and different researchers may induce different labels for a factor. Inference depends largely on key words or phrases and parallel thoughts, and labels should be based on strong theoretical underpinnings. The researcher’s inferred labels for the three factors were taken directly from the original subscale labels on the CCTDI®, and were determined by the repetition of phrases and key words within the measured items. The label given to factor one was “Open-mindedness”, the label selected for factor two was “Systematicity”, and factor three was labeled “Maturity of Judgment.” Certain items that loaded
on each of the factors were questionable about the fit with the label, but were indicated by the factor loading values.

Table 25
Extracted factors and factor loadings from data reduction using exploratory factor analysis on the CCTDI®

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor One</th>
<th>Factor Two</th>
<th>Factor Three</th>
</tr>
</thead>
<tbody>
<tr>
<td>Being open-minded about different world views is less important than people think</td>
<td>.639</td>
<td>.178</td>
<td>-.212</td>
</tr>
<tr>
<td>My opinion about controversial topics depends a lot on who I talk to last</td>
<td>.584</td>
<td>.085</td>
<td>.057</td>
</tr>
<tr>
<td>The best way to solve problems is to ask someone else for the answers</td>
<td>.565</td>
<td>.078</td>
<td>-.220</td>
</tr>
<tr>
<td>Being open-minded means you don’t know what’s true and what’s not</td>
<td>.560</td>
<td>.183</td>
<td>-.176</td>
</tr>
<tr>
<td>Powerful people determine the right answer</td>
<td>.505</td>
<td>.286</td>
<td>-.031</td>
</tr>
<tr>
<td>You are not entitled to your opinion if you are obviously mistaken</td>
<td>.483</td>
<td>.040</td>
<td>-.004</td>
</tr>
<tr>
<td>It’s just not that important to keep trying to solve difficult problems</td>
<td>.473</td>
<td>-.045</td>
<td>-.099</td>
</tr>
<tr>
<td>I pretend to be logical, but I’m not</td>
<td>.469</td>
<td>-.157</td>
<td>-.086</td>
</tr>
<tr>
<td>There is no way to know whether one solution is better than another</td>
<td>.465</td>
<td>.100</td>
<td>.007</td>
</tr>
<tr>
<td>To get people to agree with me, I would give any reason that worked</td>
<td>.465</td>
<td>.074</td>
<td>.144</td>
</tr>
</tbody>
</table>

(table cont.)
| Description                                                                 | Correlation (r) | p-value | Type 
|-----------------------------------------------------------------------------|-----------------|---------|------
| Most college courses are uninteresting and not worth taking                 | .463            | -.080   | -.103
| Many questions are just too frightening to ask                               | .458            | -.182   | .129
| Others are entitled to their opinions, but I don’t need to hear them        | .430            | .056    | -.035
| Things are as they appear to be                                              | .427            | .112    | .005
| Analogies are about as useful as a sailboat on a freeway                    | .419            | .153    | -.045
| Being impartial is impossible when I’m discussing my own opinions           | .412            | .117    | .191
| People say I rush into decisions too quickly                               | .386            | -.348   | .193
| Considering all the alternatives is a luxury I can’t afford                 | .337            | -.110   | .031
| I’m good at developing orderly plans to address complex problems            | .103            | .636    | .065
| I’m known for approaching complex problems in an orderly way                | .079            | .634    | .065
| Others look to me to keep working on a problem when the going gets tough    | .030            | .589    | .158
| My trouble is that I’m easily distracted                                    | .117            | -.564   | .326
| Others look to me to decide when the problem is solved                      | .228            | .545    | -.056
| Others look to me to establish reasonable standards to apply to decisions   | .073            | .530    | .080
| Complex problems are fun to try to figure out                               | .048            | .505    | .057

(table cont.)
<table>
<thead>
<tr>
<th>Statement</th>
<th>Value 1</th>
<th>Value 2</th>
<th>Value 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>It’s easy for me to organize my thoughts</td>
<td>0.124</td>
<td>0.458</td>
<td>0.089</td>
</tr>
<tr>
<td>I’m proud that I can think with great precision</td>
<td>-0.018</td>
<td>0.448</td>
<td>0.187</td>
</tr>
<tr>
<td>I look forward to learning^a challenging things</td>
<td>-0.151</td>
<td>0.442</td>
<td>0.328</td>
</tr>
<tr>
<td>When I have to deal with something^a really complex, it’s panic time</td>
<td>0.346</td>
<td>-0.401</td>
<td>0.212</td>
</tr>
<tr>
<td>People think I procrastinate about^a making decisions</td>
<td>0.155</td>
<td>-0.383</td>
<td>0.281</td>
</tr>
<tr>
<td>Others admire my intellectual curiosity^a and inquisitiveness</td>
<td>0.050</td>
<td>0.377</td>
<td>0.315</td>
</tr>
<tr>
<td>I really enjoy trying to figure out how things work</td>
<td>-0.037</td>
<td>0.375</td>
<td>0.192</td>
</tr>
<tr>
<td>No matter what the topic, I am eager to know more about it</td>
<td>0.197</td>
<td>0.360</td>
<td>0.176</td>
</tr>
<tr>
<td>I always focus the question before I attempt to answer it</td>
<td>-0.014</td>
<td>0.320</td>
<td>0.125</td>
</tr>
<tr>
<td>Frequently I find myself evaluating other people’s arguments</td>
<td>0.072</td>
<td>0.024</td>
<td>0.531</td>
</tr>
<tr>
<td>Getting a clear idea about the^a problem at hand is the first priority</td>
<td>-0.109</td>
<td>0.303</td>
<td>0.470</td>
</tr>
<tr>
<td>Learn everything you can, you never know when it could come in handy</td>
<td>-0.293</td>
<td>0.038</td>
<td>0.428</td>
</tr>
<tr>
<td>It bothers me when people rely on weak arguments to defend good ideas</td>
<td>0.063</td>
<td>0.068</td>
<td>0.427</td>
</tr>
<tr>
<td>People need reasons if they are going to disagree with another’s opinion</td>
<td>0.143</td>
<td>0.003</td>
<td>0.401</td>
</tr>
<tr>
<td>I take pride in my ability to understand the opinions of others</td>
<td>-0.134</td>
<td>0.058</td>
<td>0.383</td>
</tr>
</tbody>
</table>
For each of the factors, the items were analyzed to describe how the study participants responded. The responses ranged from “1 = agree strongly” to “6 = disagree strongly.”

Subscale scores were generated, with values ranging from 1.00 to 6.00, as were subscale means and standard deviations. Tables 25 through 27 show the factor and the descriptive analyses, including the text of the measured item, the mean score, standard deviation, skewness and kurtosis values. For the first factor, “Open-mindedness,” is defined by the test developers as “the ability to tolerate the views and opinions held by others, even when in opposition to one’s own views. It is the willingness to develop new schemata that will result in a more realistic perception of one’s place in the environment” (CCTDI® Test Manual, 2000 update). There were no missing responses \((n = 328)\) with an overall mean of 4.28 \((SD = 1.41)\), indicating that the students were more inclined to disagree with the statements on that scale (Table 26).

Table 26
Seventeen items from the CCTDI® loading on factor one (Open-mindedness), for 328 observations, showing the mean, standard deviation, skewness and kurtosis

<table>
<thead>
<tr>
<th>Measured Itema</th>
<th>M</th>
<th>SD</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Being open-minded about different world views is less important than people think</td>
<td>4.20</td>
<td>1.48</td>
<td>-.491</td>
<td>-.628</td>
</tr>
<tr>
<td>My opinion about controversial topics depends a lot on who I talk to last</td>
<td>4.09</td>
<td>1.39</td>
<td>-.332</td>
<td>-.682</td>
</tr>
</tbody>
</table>

aItem loaded on two factors.
<table>
<thead>
<tr>
<th>Statement</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Correlation</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>The best way to solve problems is to ask someone else for the answers</td>
<td>4.52</td>
<td>1.37</td>
<td>-.762</td>
<td>-.161</td>
</tr>
<tr>
<td>Being open-minded means you don't know what’s true and what’s not</td>
<td>4.63</td>
<td>1.43</td>
<td>-.917</td>
<td>-.014</td>
</tr>
<tr>
<td>Powerful people determine the right answer</td>
<td>3.88</td>
<td>1.55</td>
<td>-.213</td>
<td>-.950</td>
</tr>
<tr>
<td>You are not entitled to your opinion if you are obviously mistaken</td>
<td>4.38</td>
<td>1.56</td>
<td>-.684</td>
<td>-.633</td>
</tr>
<tr>
<td>It’s just not that important to keep trying to solve difficult problems</td>
<td>4.30</td>
<td>1.35</td>
<td>-.682</td>
<td>-.250</td>
</tr>
<tr>
<td>I pretend to be logical, but I’m not</td>
<td>4.61</td>
<td>1.24</td>
<td>-.571</td>
<td>-.511</td>
</tr>
<tr>
<td>There is no way to know whether one solution is better than another</td>
<td>4.21</td>
<td>1.41</td>
<td>-.518</td>
<td>-.575</td>
</tr>
<tr>
<td>To get people to agree with me I would give any reason that worked</td>
<td>3.81</td>
<td>1.62</td>
<td>-.273</td>
<td>-.995</td>
</tr>
<tr>
<td>Most college courses are uninteresting and not worth taking</td>
<td>4.38</td>
<td>1.48</td>
<td>-.729</td>
<td>-.426</td>
</tr>
<tr>
<td>Many questions are just too frightening to ask</td>
<td>4.04</td>
<td>1.47</td>
<td>-.390</td>
<td>-.768</td>
</tr>
<tr>
<td>Others are entitled to their opinions, but I don’t need to hear them</td>
<td>3.90</td>
<td>1.55</td>
<td>-.309</td>
<td>-.899</td>
</tr>
<tr>
<td>Things are as they appear to be</td>
<td>4.28</td>
<td>1.49</td>
<td>-.637</td>
<td>-.526</td>
</tr>
<tr>
<td>Analogies are about as useful as a sailboat on a freeway</td>
<td>3.96</td>
<td>1.42</td>
<td>-.306</td>
<td>-.556</td>
</tr>
</tbody>
</table>

(table cont.)
Being impartial is impossible when I’m discussing my own opinions

Considering all the alternatives is a luxury I can’t afford

Overall Mean and Standard Deviation

<table>
<thead>
<tr>
<th>Measured Item</th>
<th>M</th>
<th>SD</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>I’m good at developing orderly plans to address complex problems</td>
<td>3.17</td>
<td>1.28</td>
<td>-.002</td>
<td>-.398</td>
</tr>
<tr>
<td>I’m known for approaching complex problems in an orderly way</td>
<td>3.21</td>
<td>1.35</td>
<td>.020</td>
<td>-.679</td>
</tr>
<tr>
<td>Others look to me to keep working on a problem when the going gets tough</td>
<td>2.91</td>
<td>1.38</td>
<td>.299</td>
<td>-.612</td>
</tr>
</tbody>
</table>

"Systematicity," defined as “the art of organizing and strategizing for optimal success in plans and decisions. It is the tendency for one to define necessary and orderly steps to continue through a project or plan to its completion” (CCTDI® Test Manual, 2000 update). The subscores for this factor had an overall mean of 3.09 (SD = 1.37). The average of the scores was ambiguous (basically neutral), indicating slightly more agreement than disagreement with the statements involved with this factor (Table 27).

Table 27
Thirteen items from the CCTDI® loading on factor two (Systematicity), for 328 observations, showing the mean, standard deviation, skewness and kurtosis

<table>
<thead>
<tr>
<th>Measured Item</th>
<th>M</th>
<th>SD</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>I’m good at developing orderly plans to address complex problems</td>
<td>3.17</td>
<td>1.28</td>
<td>-.002</td>
<td>-.398</td>
</tr>
<tr>
<td>I’m known for approaching complex problems in an orderly way</td>
<td>3.21</td>
<td>1.35</td>
<td>.020</td>
<td>-.679</td>
</tr>
</tbody>
</table>
| Others look to me to keep working on a problem when the going gets tough | 2.91| 1.38| .299     | -.612    | (table cont.)
<table>
<thead>
<tr>
<th>Statement</th>
<th>Mean</th>
<th>SD</th>
<th>Corr</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>My trouble is that I’m easily distracted</td>
<td>2.67</td>
<td>1.54</td>
<td>.664</td>
<td>-.422</td>
<td></td>
</tr>
<tr>
<td>Others look to me to decide when the problem is solved</td>
<td>3.52</td>
<td>1.34</td>
<td>-.089</td>
<td>-.488</td>
<td></td>
</tr>
<tr>
<td>Others look to me to establish reasonable standards to apply to decisions</td>
<td>3.10</td>
<td>1.27</td>
<td>-.038</td>
<td>-.441</td>
<td></td>
</tr>
<tr>
<td>Complex problems are fun to try to figure out</td>
<td>3.05</td>
<td>1.44</td>
<td>.243</td>
<td>-.771</td>
<td></td>
</tr>
<tr>
<td>It’s easy for me to organize my thoughts</td>
<td>3.03</td>
<td>1.45</td>
<td>.272</td>
<td>-.857</td>
<td></td>
</tr>
<tr>
<td>I’m proud that I can think with great precision</td>
<td>2.47</td>
<td>1.67</td>
<td>.538</td>
<td>-.127</td>
<td></td>
</tr>
<tr>
<td>If I have to work on a problem, I can put other things out of my mind</td>
<td>3.63</td>
<td>1.44</td>
<td>-.131</td>
<td>-.795</td>
<td></td>
</tr>
<tr>
<td>I really enjoy trying to figure out how things work</td>
<td>2.60</td>
<td>1.36</td>
<td>.589</td>
<td>-.348</td>
<td></td>
</tr>
<tr>
<td>No matter what the topic, I am eager to know more about it</td>
<td>3.40</td>
<td>1.49</td>
<td>-.054</td>
<td>-.889</td>
<td></td>
</tr>
<tr>
<td>I always focus the question before I attempt to answer it</td>
<td>2.54</td>
<td>1.28</td>
<td>.581</td>
<td>-.336</td>
<td></td>
</tr>
</tbody>
</table>

Overall Mean and SD  

- **Mean**: 3.02
- **SD**: 1.41

---

*a* Number of observations was 328 for each item.

The third factor extracted was labeled “Maturity of Judgment”, which is defined as “the ability to accept the panoramic view of situations, with accepting that there may be multiple
solutions to a given problem. It is the ability to suspend and revise judgments when necessary, but keeping in mind the ultimate need for closure.” (CCTDI® Test Manual, 2000 update). The mean of the subscores for this factor was 2.50 (SD = 1.32), indicating that collectively there was greater agreement for this items than disagreement (Table 28).

Table 28
Seven items from the CCTDI® loading on factor three (Maturity of Judgment), showing the means, standard deviations, skewness and kurtosis

<table>
<thead>
<tr>
<th>Measured Item</th>
<th>M</th>
<th>SD</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>People need reasons if they are going to disagree with another’s opinion</td>
<td>2.58</td>
<td>1.45</td>
<td>.677</td>
<td>-.387</td>
</tr>
<tr>
<td>Getting a clear idea about the problem at hand is the first priority</td>
<td>2.27</td>
<td>1.14</td>
<td>.570</td>
<td>-.382</td>
</tr>
<tr>
<td>I take pride in my ability to understand the opinions of others</td>
<td>2.43</td>
<td>1.12</td>
<td>.572</td>
<td>.135</td>
</tr>
<tr>
<td>Learn everything you can, you never know when it could come in handy</td>
<td>1.93</td>
<td>1.14</td>
<td>1.169</td>
<td>.970</td>
</tr>
<tr>
<td>Frankly, I am trying to be less judgmental</td>
<td>2.47</td>
<td>1.25</td>
<td>.639</td>
<td>-.089</td>
</tr>
<tr>
<td>Frequently I find myself evaluating other people’s arguments</td>
<td>2.89</td>
<td>1.39</td>
<td>.383</td>
<td>-.556</td>
</tr>
<tr>
<td>It bothers me when people rely on weak arguments to defend good ideas</td>
<td>2.47</td>
<td>1.32</td>
<td>.571</td>
<td>-.478</td>
</tr>
</tbody>
</table>

| Overall Mean and SD | 2.43 | 1.27 |

*Number of respondents was 320 for each item*
The three factors extracted were checked for intercorrelations between the factors and the subscales, as were interpreted using Davis’ (1971) explanation of associations (.00 - .09 = negligible, .10 - .29 = low, .30 - .49 = moderate, .50 - .69 = substantial, .70 and higher = very strong). There were low associations between the factor “Open-mindedness” and the other two factors. Factors 2 and 3 (Systematicity and Maturity of Judgment) were moderately correlated (\( r = .408, p < .001 \)) (Table 29). The correlations indicate that the factors are basically non-discrete and non-orthogonal, as was the case with the original test items and the original scales of measurement.

Table 29
Correlations for the extracted factors “Open-mindedness,” “Systematicity,” and “Maturity of Judgment,” using exploratory factor analysis for the CCTDI®

<table>
<thead>
<tr>
<th></th>
<th>Open-mindedness</th>
<th>Systematicity</th>
<th>Maturity of Judgment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open-mindedness</td>
<td>.005</td>
<td>-.112*</td>
<td></td>
</tr>
<tr>
<td>Systematicity</td>
<td>.005</td>
<td>.408**</td>
<td></td>
</tr>
<tr>
<td>Maturity of Judgment</td>
<td>-.112*</td>
<td>.408**</td>
<td></td>
</tr>
</tbody>
</table>

**Correlation is significant at the .01 level (2-tailed).

Based on the averages for the inter-item correlations, reliability coefficients were calculated for the variables included in the extracted factors, using Cronbach’s Alpha measure on internal consistency. The purpose for calculating reliability values is to determine if the responses of the participants in the current data set are similar. Low reliability coefficients mean that the respondents were different in their choices of answers for a given item. The three extracted factors had reliability coefficients ranging from moderate to high (.678 to .826) (Table 30).
Table 30
Reliability of item measurement, scale mean scores and standard deviations for three extracted factors, using exploratory factor analysis for the CCTDI®

<table>
<thead>
<tr>
<th>Factor/Scale</th>
<th>Number of items</th>
<th>Scale Mean</th>
<th>Scale SD</th>
<th>Reliability&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open-mindedness</td>
<td>17</td>
<td>70.58</td>
<td>12.547</td>
<td>.826</td>
</tr>
<tr>
<td>Systematicity</td>
<td>13</td>
<td>39.30</td>
<td>8.631</td>
<td>.728</td>
</tr>
<tr>
<td>Maturity of Judgment</td>
<td>7</td>
<td>17.04</td>
<td>5.170</td>
<td>.678</td>
</tr>
</tbody>
</table>

<sup>a</sup>Reliability calculated using Cronbach’s Alpha measure of internal consistency and reliability.

The CCTDI®, based on initial face validity, was considered by the researcher to be closely aligned with the skills directly targeted in the ACM study (critical thinking, projection, analysis of consequences, rational decision-making, etc.). It served as two measures; 1) a direct measure of the difference between pre and post scores, and 2) an indirect measure of a possible relationship with the semester outcomes of grade point average, progression and persistence. To determine the value of including the extracted subscales for objectives three through five, correlation analysis was conducted. None of the subscales were significantly related to the outcomes of interest, though “Maturity of Judgment” had very slight negative relationship (Table 31). Results from analysis of the CCTDI® were considered non-beneficial for inclusion in analysis for the remaining objectives of the study.

Table 31
Correlation of the CCTDI® extracted subscales “Open-mindedness,” “Systematicity,” and “Maturity of Judgment” with semester grade point average, progression, and persistence

<table>
<thead>
<tr>
<th>Factor/Scale</th>
<th>Semester G.P.A.</th>
<th>Progression</th>
<th>Persistence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;sup&gt;r&lt;/sup&gt;</td>
<td>&lt;sup&gt;r&lt;/sup&gt;</td>
<td>&lt;sup&gt;r&lt;/sup&gt;</td>
</tr>
<tr>
<td>Open-mindedness</td>
<td>.106</td>
<td>.104</td>
<td>.116</td>
</tr>
<tr>
<td>Systematicity</td>
<td>.057</td>
<td>.063</td>
<td>.100</td>
</tr>
</tbody>
</table>

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Before conducting analysis of variance and analysis of covariance to compare groups on the ACM quiz and CCTDI® post-test scores, values were generated using one-way ANOVA to check for significant differences in the groups on the 15 persistence factors. The groups were significantly different for the number of semester hours enrolled (\(p = .003\)) and for age (\(p = .002\)). The range in age for the control group was from 17 to 24 years (\(M = 18.74, SD = 1.261\)), while the ACM group was 17 to 21 (with six of the seven 17 year olds), and had a mean age of 18.34 (\(SD = .750\)). Students in the ACM group were, on average, enrolled in more semester hours (\(M = 15.53, SD = 2.077\)), the control group mean was 14.66, (\(SD = 2.501\)) Neither of the factors were correlated highly enough to include as a covariate in the analysis of variance, and the group differences are to be noted for interpretation by the reader.

The CCTDI® pre and post-test scores were highly correlated (\(r = .798, p < .001\)), as was expected, and the pre-test scores were included as a covariate in comparing groups on post scores. Analysis of co-variance was run using type III sums of squares in the general linear model for determining differences for the CCTDI® post-test scores between the treatment and control group, controlling for the effect of the pre-test (a model of the Solomon 4-Group design was selected for its unique ability to control testing threats to internal validity, thus the pre-test was used as a covariate with the post-test). Before running the model, CCTDI® pre and post-test data was checked for normality and homogeneity of variance. One hundred and eighteen students took the pre-test, with data approximately normally distributed (skewness of .207; kurtosis of -.197). Post-test data, approximating a normal distribution, had a slightly higher positive skew (.627) and negligible kurtosis (.038). The Brown-Forsythe test of robustness of the

| Table (cont.) | Maturity of Judgment | -0.073 | -0.092 | -0.108 |

*aCorrelation coefficients calculated using Pearson’s correlation.*
means revealed that the variances within the groups were not a violation, with significant comparison of the between group means for the pre-test ($p = .011$), but not for the post-test scores ($p = .726$). Brown-Forsythe serves to measure homogeneity more accurately than Levene’s test when groups are unequal in number. Since the group sizes were so similar (no difference for the pre-test and only six for the post-test), homogeneity of variance values using Levene’s test concurred with the Brown-Forsythe outcome, with non-significant values (pre-test, $p = .765$; post-test, $p = .333$). Assumptions were met for the analysis of covariance to continue.

With the CCTDI® post-test scores as the dependent variable, the ACM group type as the independent variable, and CCTDI® pre-test scores as a covariate (Pearson’s $r = .798$), the measured effect of the ACM study on the propensity for incorporating critical thinking skills was not significant ($p = .281$). It should be noted that the mean post-test score for the control group decreased ($274.882; \text{SD} = 30.363$), while the mean for the treatment group increased ($273.481; \text{SD} = 27.435$), though statistical regression cannot be ruled out, as the study participants were not randomly assigned to the groups. The outcome was not statistically significant, though the direction of change revealed the expected trend for the treatment group. A comparison of the means for each of the subscales, by group type, revealed that three of the pre-test means were significantly different between the treatment and control groups, but none of the post-test mean scores were significantly different (Table 32).

Table 32
Analysis of variance source table comparing CCTDI® subscale scores for the pre and post-tests

<table>
<thead>
<tr>
<th>Subscale</th>
<th>ACM M</th>
<th>ACM SD</th>
<th>Control M</th>
<th>Control SD</th>
<th>$F$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-test</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Truth-seeking</td>
<td>271.2</td>
<td>29.6</td>
<td>285.4</td>
<td>29.7</td>
<td>6.68</td>
<td>.011</td>
</tr>
<tr>
<td></td>
<td>32.20</td>
<td>5.65</td>
<td>34.29</td>
<td>5.43</td>
<td>4.18</td>
<td>.043</td>
</tr>
</tbody>
</table>

138
The ACM quiz was selected as an immediate measure of the direct effects of the ACM study on the students’ ability to apply critical thinking skills. This measure was considered foundational to the overall measures of the study; the indirect effects of improving academic performance (grades, progressing in a chosen curriculum and persisting in the university) as a result of participation in activities that intrusively model critical thinking skills while addressing academic dynamics. The ACM study’s activities (five class sessions) culminated with the administration of the ACM quiz, an instrument developed by the researcher for measuring the direct affects of the ACM study activities. All sections of the freshman seminar class were given the quiz during the same week of the semester (Monday and Tuesday, September 25 and 26, 2006). The study data was checked for homogeneity of variance using the Levene’s test, with results showing a non-significant p value (p = .594), and symmetry values (skewness = .175; kurtosis = .095) indicated that the data was normally distributed. Because of the unequal group sizes (control, n = 127; treatment, n = 131), the assumption of homogeneity of variance was checked using the Brown-Forsythe test, a robust test of the equality of means, which measures variance from the group median rather than the group mean (used in cases of unequal group
sizes). Glass and Hopkins (1996) pointed out that both the Levene’s and Brown-Forsythe tests rely on absolute deviations, and with unequal group sizes, the robustness of the tests may be lost, with significance values being affected by skews from the absolute means. Results from the Brown-Forsythe test concurred with Levene’s test and the ANOVA source table that the difference in mean ACM quiz scores for the treatment and control groups were highly significant \((p < .001)\). To account for unequal group sizes, Brown-Forsythe calculations sacrificed 5.17 degrees of freedom, but had a negligible effect on the F statistic \((F = 58.158)\).

The ACM quiz was checked for intercorrelation with the student demographics and items from the persistence factors questionnaire. ACT Composite and “hours enrolled” both had significant \((p < .001)\), but weak correlations; ACT Composite \((r = .272)\) and “hours enrolled” \((r = .176)\). Neither of the correlations was strong enough to use as a covariate for comparing the effectiveness of the ACM study on the quiz scores for the treatment and control groups. A one-way analysis of variance was run, with ACM quiz as the dependent variable and ACM participation as the independent variable. Results revealed that there was a significant difference for the treatment and control groups \((p < .001)\). The mean score for the control group \((n = 122)\) was 7.48 \((SD = 2.803)\) as compared to the mean quiz score for the treatment group \((n = 117)\) of 10.39 \((SD = 3.044)\). The control group scores had a slight negative skew (-.326) and were slightly platykurtotic (-.132). The treatment group data had a slight positive skew (.479) and kurtosis of .095. Scores for the control group ranged from 0 – 14 compared to a range from 4 – 20 for the treatment group. An analysis of variance source table was generated for computing the residual and their sums of squares and calculating the F statistic \((F = 58.485)\). Values for the sums of squares and the F statistic both indicated that the proportion of variance in the outcome
variable associated with participation in the ACM study was about one-fifth of the amount of variance due to other factors (Table 33).

Table 33
ANOVA source table showing difference in ACM quiz scores by group type and variation in scores due to unknown factors

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>Sum of Squares</th>
<th>df</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACM participation</td>
<td>499.234</td>
<td>1</td>
<td>58.485</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Other variance</td>
<td>1997.444</td>
<td>234</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Objective 3 Results**

The third objective was to determine the correct model fit for explaining the proportion of variance in the students’ academic achievement, as measured by grade point average at the end of the semester of the study, using selected persistence factors and whether or not they participated in the ACM study (including the direct measures of the study, the ACM quiz and the CCTDI® post-test).

The overall mean for semester grade point average was 2.35 (SD = .94167). The treatment group had a mean semester grade point average of 2.57 (SD = .90987), while the control group’s mean was 2.12 (SD = .92250) for semester grade point average. The dependent variable was checked for correlation with the demographics gender, ethnicity, age, and the selected academic persistence factors, (ACT composite, hours enrolled, rating of study skills, and parents’ level of education, as measured by college graduation), the personal persistence factors (place of residence, time spent commuting to campus, hours spent reading on a weekly basis, hours spent watching television on a daily basis, and number of nights out each week for socializing), and the selected financial persistence factors (worry about bills, primary source of financial help for college costs, and weekly work hours). Semester grade point average was also
checked for an association with participation in the ACM study, overall, and with the direct measures of the study’s effectiveness, the ACM quiz, and the CCTDI® post-total score. Based on the type of data, correlations were run using Pearson’s or Spearman’s correlation analysis. Out of the 15 persistence factors on the questionnaire that were considered for inclusion in the model, six had a significant relationship with semester grade point average (gender, ACT composite, hours enrolled, hours of reading, worry about bills, and hours worked). ACT composite had the highest (though still relatively low) correlation with semester grade point average ($r = .321$). Even though the strength of the relationship with semester grade point average was weak for all six of the persistence factors, the association was significant. Semester grade point average was also significantly associated with participation in the study ($r = .239$) and with the direct measures of the ACM quiz ($r = .370$) and the CCTDI® post-test scores ($r = .149$) (Table 34).

Table 34
Correlation coefficients for 15 student persistence factors, and the factors of ACM study participation, ACM quiz scores, and CCTDI® scores, showing association with semester grade point average

<table>
<thead>
<tr>
<th>Factor</th>
<th>n</th>
<th>r</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>258</td>
<td>.156</td>
<td>.008</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>254</td>
<td>.073</td>
<td>.244</td>
</tr>
<tr>
<td>Age</td>
<td>258</td>
<td>-.007</td>
<td>.906</td>
</tr>
<tr>
<td>Academic Persistence Factors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACT Composite</td>
<td>258</td>
<td>.316</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Number of hours enrolled</td>
<td>258</td>
<td>.163</td>
<td>.009</td>
</tr>
<tr>
<td>Rating of study skills</td>
<td>238</td>
<td>.126</td>
<td>.052</td>
</tr>
</tbody>
</table>

(table cont.)
Parents’ graduation 238 -.092a .158

**Personal Persistence Factors**

Hours spent reading on a daily basis 238 .134 .019

Number of nights out per week 238 -.120 .066

Hours of TV per day 238 -.104 .110

Residence 244 -.060a .350

Time spent commuting 244 .026 .685

**Financial Persistence Factors**

Worry about bills 243 .158 .007

Weekly number of work hours 243 -.154 .009

Primary source of financial help 240 .033 .607

**ACM Measures**

ACM quiz scores 236 .370 <.001

Study participation 238 .239 <.001

CCTDI® post-test scores 210 .149 .031

aSpearman’s rho was used for correlation analysis (Pearson’s r was used for correlation analysis unless otherwise noted).

Note: Variable categories include: Gender, “1 = male” and “2 = female”; Ethnicity,“1 = black,” “2 = nonblack”; Study skills,“1 = needs improvement,” “2 = good,” “3 = excellent”; Parents’ graduation, “1 = neither parent,” “2 = one parent,” and “3 = both parents”; Residence, “1 = family home,” “2 = on-campus housing,” and “3 = off-campus housing”; Financial source, “1 = external sources (scholarships, loans and grants)” and “2 = parents and/or self”; Worry about bills, “1 = no” and “2 = yes.”

Due to the significance of the relationships with the dependent variable, the six persistence factors from the questionnaire (with ACT scores limited to the composite score only), ACM participation, and the direct measures, ACM quiz and CCTDI® post-total scores, were added to the multiple regression analysis. The predictors were entered stepwise in a linear model of Multiple Regression Analysis, which assumes a continuing linear relationship between
the dependent variable and each of the predictors, homoscedasticity of deviations from the line of regression, and normally distributed residuals. Serious departures from these assumptions can be detected by scatterplots of the dependent variable against each predictor, or by predicted residual or normal residual plots. To test the assumptions of linearity, homoscedasticity, and normality for running MRA, scatterplots were created for each of the predictors against semester grade point average, and for the normal and predicted residuals. A histogram of the residuals was created to further depict whether or not the residuals were normally distributed. The resulting graphs appeared to be reasonable for running a linear regression model. A scatterplot of the scores showed a good “buck-shot” pattern. Casewise diagnostics revealed that several cases (22, 28, 63, 215, 228, and 255) were suspicious, based on the difference between actual and predicted semester grade point averages. The cases had standardized residuals ranging from -3.096 to -4.146. Five of the cases had grade point averages below what was expected. Scrutiny of each case for its influence on the intercept, slope, and each term in the regression model was checked with Cook’s D, Centered Leverage, and DFBeta. The Cook’s D values were all <.45 (ranging from .01936 to .03725), indicating that they did not have a substantial influence on the calculation of the regression statistics (intercept or slope). Excluding the cases would have a negligible influence on the coefficients, so removal was not warranted. Hair et al. (1995) stressed that even more important than the diagnostic value itself is a large gap in values, indicating a suspicious deviation for the remaining cases. There were no large gaps in Cook’s D values between the suspicious cases and the other data points, and the case scores (semester grade point average) were not errors in measurement. Leverage for each of the cases ranged from .00786 to 0.1972, indicating that there was not high leverage, thus the cases did not influence the slope of the regression line. Again, removal was not warranted, as there was no
measurement error. Most importantly, there were no large gaps between values of data points when all case diagnostics were considered. The suspicious cases were incongruent with the trend in responses for the predictor “ACT composite.” The change in beta values for the predictors when each case was removed (DFBeta) was negligible (<.12). None of the cases warranted further scrutiny or removal from the data set (Table 35).

Table 35
Casewise diagnostics for predictors entered into MRA model against semester grade point average

<table>
<thead>
<tr>
<th>Case Number</th>
<th>SRES</th>
<th>Cook’s D</th>
<th>Leverage</th>
<th>ACT</th>
<th>GPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>-4.146</td>
<td>.01936</td>
<td>.00786</td>
<td>20</td>
<td>0.25</td>
</tr>
<tr>
<td>28</td>
<td>-3.884</td>
<td>.03725</td>
<td>.01483</td>
<td>23</td>
<td>0.00</td>
</tr>
<tr>
<td>63</td>
<td>-3.800</td>
<td>.03337</td>
<td>.01806</td>
<td>22</td>
<td>0.00</td>
</tr>
<tr>
<td>215</td>
<td>3.474</td>
<td>.03649</td>
<td>.01972</td>
<td>18</td>
<td>4.00</td>
</tr>
<tr>
<td>228</td>
<td>-3.096</td>
<td>.01990</td>
<td>.01242</td>
<td>20</td>
<td>0.00</td>
</tr>
<tr>
<td>255</td>
<td>-4.066</td>
<td>.02813</td>
<td>.01633</td>
<td>21</td>
<td>0.00</td>
</tr>
</tbody>
</table>

The model was run using stepwise entry, with nine predictors to be evaluated (six persistence factors, ACM participation, CCTDI® post-test scores and ACM quiz) against the response of semester grade point average. Stepwise entry included predictors that significantly contributed to the model (at least 1% contribution in explaining outcome variation), at the .05 level of significance, and were excluded if the predictor did not significantly contribute to the explanation of the variance in grade point average at the .10 level of significance. The model summary concluded that only six of the predictors substantially contributed to the model, including ACT composite scores, participation in the ACM study, hours spent reading, ACM
quiz scores, gender, and worry about paying monthly bills. As a whole, those six predictors had a moderate correlation with semester grade point average ($r = .592$), with the ACT composite accounting for the greatest amount of variance (18.7%). The six predictors together accounted for approximately 35% ($R^2 = .350$) of the total variance in semester grade point average. From a statistical perspective, the ANOVA source table revealed the acceptability of the regression model. The model looked positive, as the F statistic ($F = 16.504$) was highly significant ($p < .001$). However, the variance in grade point average due to unknown factors was greater than the variance due to the predictors (Table 36).

Table 36
ANOVA source table for MRA model with six predictors against semester grade point average

<table>
<thead>
<tr>
<th>Model</th>
<th>Sums of Squares</th>
<th>df</th>
<th>F statistic</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression$^a$</td>
<td>41.335</td>
<td>6</td>
<td>16.504</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Residual</td>
<td>76.806</td>
<td>184</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$^a$Predictors entered into model included ACT composite, ACM participation, hours of weekly reading, ACM quiz, gender, and worry about bills.

The constant (intercept) was (-.846) with the inclusion of the six predictors. The calculated coefficients (unstandardized beta value) for each of the predictors indicated the amount of increase in semester grade point average expected for each increment increase in the predictor. The standardized beta coefficients shows the importance of the predictor in how much it contributes to the model, and predictors are ordered accordingly in Table 37. The factors excluded from the model were “hours enrolled,” “hours of work,” and CTDI® post-test scores.

Table 37
Regression coefficients for variables included in the MRA model against semester G.P.A.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>$b$</th>
<th>Standardized $b$</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(table cont.)
Closer observation of the coefficients revealed that a slight problem with collinearity existed. None of the predictors had sharp drops in correlation after zero-order for part and partial, but the change in coefficients at each step in the model indicated that a portion of the variance attributed to one factor was explained by the other predictors in the model (Table 38).

Table 38
Zero-order, part and partial correlations for six predictors included in the MRA model against semester grade point average

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Zero-order</th>
<th>Partial</th>
<th>Part</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACT composite</td>
<td>.433</td>
<td>.375</td>
<td>.326</td>
</tr>
<tr>
<td>ACM quiz scores</td>
<td>.358</td>
<td>.203</td>
<td>.167</td>
</tr>
<tr>
<td>Gender</td>
<td>.155</td>
<td>.188</td>
<td>.155</td>
</tr>
<tr>
<td>Hours spent reading</td>
<td>.268</td>
<td>.188</td>
<td>.155</td>
</tr>
<tr>
<td>ACM study participation</td>
<td>.295</td>
<td>.153</td>
<td>.124</td>
</tr>
<tr>
<td>Worry about bills</td>
<td>.171</td>
<td>.144</td>
<td>.118</td>
</tr>
</tbody>
</table>

Collinearity diagnostics showed the percentage of variance that could not be explained by the other factors. Tolerance and Variance Inflation Factor (VIF) statistics indicate possible
problems with collinearity for tolerance values <.8 and VIF values >2.0. ACM quiz scores had the lowest tolerance factor (.722), meaning that approximately 28% of the variance accounted for by ACM quiz scores was also explained by one or more of the other predictors. Tolerance for ACM participation was a little higher (.771), indicating that approximately 23% of the variance accounted for was explained by other predictors. The other factors had tolerance >.8, indicating that only a small portion of the variance in the factor was explained by the other predictors.

Variance inflation factors (VIF) greater than 2.0 are a problem (Hair et al., 1995). None of the predictors showed problems with VIF, with values ranging from 1.017 to 1.384. Further collinearity diagnostics showed that none of the predictors had eigenvalues of 1.0 or higher. Small eigenvalues (close to zero) presents a serious multicollinearity problem. Three of the predictors (ACM quiz, gender, and worry about bills) had eigenvalues close to zero (.067, .033 and .008, respectively), and required data transformation to detect where the problem was most critical. Condition indices (calculations for each factor based on the largest eigenvalue) above 10.0 are problematic, indicating that the factors are intercorrelated, and that very small changes in the data values would result in large changes in the beta coefficients. Gender and worry about paying bills both had condition indices higher than 10.0 (Table 39).

Table 39
Predictor collinearity coefficients and diagnostics for student persistence factors and ACM study participation included in the MRA model against semester grade point average

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Tolerance</th>
<th>VIF</th>
<th>Eigenvalue</th>
<th>Condition Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACT composite</td>
<td>.892</td>
<td>1.122</td>
<td>.426</td>
<td>3.761</td>
</tr>
<tr>
<td>ACM study participation</td>
<td>.771</td>
<td>1.298</td>
<td>.342</td>
<td>4.196</td>
</tr>
<tr>
<td>Hours spent reading</td>
<td>.938</td>
<td>1.066</td>
<td>.101</td>
<td>7.711</td>
</tr>
</tbody>
</table>
To address the problem with low eigenvalues and high condition indices (collinearity indicators) the regression model was run again, this time using standardized scores for the independent variables against semester grade point average. The overall model fit changed ($r = .523; R^2 = .274$), and the predictor “hours reading” was dropped from the model. It was excluded ($p = .095$) at the step when gender was entered into the model, indicating that reading and gender were intercorrelated and that only one was necessary for accounting for the apportioned variance in semester grade point average. Hours of reading had a large change in significance at the point when ACT composite was entered into the model (step two), from $p = .009$ to $p = .031$, revealing that reading was intercorrelated with ACT composite as well. The remaining five predictors were highly significant in the model ($p < .05$). Beta values improved for all of the predictors, except for worry about paying monthly bills, as well as improvements in the level of significance (Table 40).

Table 40
Regression coefficients for standardized predictors included in the MRA model against semester grade point average

<table>
<thead>
<tr>
<th>Predictor</th>
<th>b</th>
<th>Standardized Beta</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z ACT composite</td>
<td>.256</td>
<td>.275</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Z ACM quiz scores</td>
<td>.197</td>
<td>.213</td>
<td>.002</td>
</tr>
<tr>
<td>Z Gender</td>
<td>.285</td>
<td>.150</td>
<td>.013</td>
</tr>
</tbody>
</table>
Correlation output changed from the unstandardized model for all of the predictors, with values improving for ACM quiz, ACM study participation, and worry about monthly bills. The correlation coefficients for ACT composite and gender decreased, indicating that there was some loss (though not considered significant) with the exclusion of the predictor, hours of reading (Table 41).

Table 41
Zero-order, part and partial correlations for the five retained standardized predictors in the MRA model against semester grade point average

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Zero-order</th>
<th>Partial</th>
<th>Part</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z ACT composite</td>
<td>.345</td>
<td>.297</td>
<td>.265</td>
</tr>
<tr>
<td>Z ACM quiz scores</td>
<td>.360</td>
<td>.209</td>
<td>.182</td>
</tr>
<tr>
<td>Z Gender</td>
<td>.137</td>
<td>.170</td>
<td>.147</td>
</tr>
<tr>
<td>Z ACM study participation</td>
<td>.320</td>
<td>.174</td>
<td>.150</td>
</tr>
<tr>
<td>Z Worry about bills</td>
<td>.185</td>
<td>.162</td>
<td>.140</td>
</tr>
</tbody>
</table>

Collinearity values (tolerance, VIF, Eigenvalues, and condition indices) changed for the retained predictors in the model, with ACM quiz the only predictor with an eigenvalue greater than 1.0. The other predictors, though still below 1.0, had condition indices of less than 10.0. The low eigenvalues for gender and worry about paying bills were of some concern, but were accepted based on the other adequate collinearity statistics (Table 42).
Table 42
Standardized predictor collinearity coefficients and diagnostics for student persistence factors and ACM study participation included in the MRA model against semester grade point average

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Tolerance</th>
<th>VIF</th>
<th>Eigenvalue</th>
<th>Condition In.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z ACT composite</td>
<td>.932</td>
<td>1.073</td>
<td>.968</td>
<td>1.639</td>
</tr>
<tr>
<td>Z ACM study participation</td>
<td>.768</td>
<td>1.302</td>
<td>.792</td>
<td>1.811</td>
</tr>
<tr>
<td>Z ACM quiz scores</td>
<td>.731</td>
<td>1.369</td>
<td>1.329</td>
<td>1.399</td>
</tr>
<tr>
<td>Z Gender</td>
<td>.959</td>
<td>1.043</td>
<td>.270</td>
<td>3.103</td>
</tr>
<tr>
<td>Z Worry about bills</td>
<td>.989</td>
<td>1.014</td>
<td>.042</td>
<td>7.865</td>
</tr>
</tbody>
</table>

Casewise diagnostics revealed all but one of the previously identified influential data points, but there were changes in the diagnostic values calculated after the predictors were standardized. Case 228 barely met the cut-off (3.0) for inclusion in the first run of the MRA model, and was not identified as a possible outlier in the second run with the standardized predictors, though the value was still >2.0. Distance and influential diagnostics, though exhibiting slight changes in the new model, reaffirmed that the cases did not place undue influence on the regression coefficients (Table 43).

Table 43
Casewise diagnostics for predictors entered into MRA model against against semester grade point average

<table>
<thead>
<tr>
<th>Case Number</th>
<th>SRES</th>
<th>Cook’s D</th>
<th>Leverage</th>
<th>ACT</th>
<th>GPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>-3.276</td>
<td>.02948</td>
<td>.01133</td>
<td>20</td>
<td>0.25</td>
</tr>
<tr>
<td>28</td>
<td>-3.095</td>
<td>.07149</td>
<td>.03655</td>
<td>23</td>
<td>0.00</td>
</tr>
<tr>
<td>63</td>
<td>-3.232</td>
<td>.05228</td>
<td>.02371</td>
<td>22</td>
<td>0.00</td>
</tr>
</tbody>
</table>
| 215         | 3.176 | .05089   | .02393   | 18  | 4.00| (table cont.)
The F statistic in the ANOVA source table decreased in the new model, but was still significant (p < .001). The sum of squares for the residuals increased dramatically (from 76.806 to 134.691) with the standardization of the predictors and the exclusion of the variable “hours of reading.” The sums of squares for regression also increased (from 41.335 to 50.672), but the proportion of variance explained increased for the error term and decreased for the model (Table 44).

Table 44
ANOVA source table for MRA model with five standardized predictors against semester grade point average

<table>
<thead>
<tr>
<th>Model</th>
<th>Sums of Squares</th>
<th>df</th>
<th>F statistic</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression^a</td>
<td>50.672</td>
<td>5</td>
<td>15.801</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Residual</td>
<td>134.691</td>
<td>210</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

^aPredictors entered into model included ZACT composite, ZACM participation, ZACM quiz, Zgender, and Zworry about bills.

The stepwise MRA model (including the predictors of participation in the ACM study, ACM quiz scores, ACT composite scores, gender of the participant, and worry about paying monthly bills), defined the best fit for explaining the greatest amount of variance in semester grade point average. With this combination of predictors, all increases in semester grade point average were associated with positive changes in the predictors. The categorical variable increases meant that females achieved higher grade point averages than did males, and students who worried about paying monthly bills earned higher grades, but only slightly higher than those who did not worry about bills.
Objective 4 Results

The purpose of objective four was to determine the correct model fit for explaining a significant proportion of the variance in student progression, as measured by the percentage of scheduled courses completed, by selected persistence factors and by whether or not the study subjects enrolled in the freshman seminar course participated in the ACM academic advising system (including the direct measures of the study, the ACM quiz and the CCTDI® post-test).

The outcome of interest for this objective was the percent of hours that the students successfully completed (with a D or above) out of those in which they were enrolled. The percent of hours completed is referred to as student progression, which is essential for students to maintain financial aid and for graduation. The control group completed an average of 73.5% of their hours ($SD = 28.0\%$) while the ACM group completed an average of 77.4% ($SD = 28.1\%$). The difference was not significant ($p = 0.874$). The overall mean for progression for students in the study was 75.5% ($SD = .28064$)

The dependent variable was checked for correlation with the demographics gender, ethnicity, age, and the selected academic persistence factors, (ACT composite, hours enrolled, rating of study skills, and parents’ level of education, as measured by college graduation), the selected personal persistence factors (place of residence, time spent commuting to campus, hours spent reading on a weekly basis, hours spent watching television on a daily basis, and number of nights out each week for socializing), and the selected financial persistence factors (worry about bills, primary source of financial help for college costs, and weekly work hours). Progression was also checked for an association with participation in the ACM study, overall, and with the direct measures of the study’s effectiveness, the ACM quiz, and the CCTDI® post-test total scores. Based on the type of data, correlations were run using Pearson’s or Spearman’s
formulas. Point-biserial was calculated using Pearson’s formula, and Rank-biserial was calculated using Spearman’s rho. Out of the 15 persistence factors on the questionnaire, the participation in either the treatment or control group, and the direct measures of the ACM study (quiz and CCTDI® post-test scores) that were considered for inclusion in the model, only three variables were significantly associated with the number of hours completed for the semester; ACT composite ($r = .201; p < .001$), gender ($r = .157; p < .011$), and the ACM quiz ($r = .222; p < .001$). Even though the strength of the relationships with progression (number of semester hours successfully completed) was weak, the significant association warranted their inclusion in the model. It’s important to note, that even though the ACM quiz scores are significantly correlated, the student’s participation in the ACM study (treatment or control group) was not significantly associated with the outcome of hours completed for the semester. The ACM quiz was a direct measure of the ACM study effectiveness, which indirectly implicates the study. For correlation values below .3, the association will be severely limited in explaining the variability of the dependent variable. Correlations were conducted based on different numbers of cases for the measures of association. Even though there were 258 cases with no missing data for progression, some of the variables were missing up to 20 missing cases (Table 45).

Table 45
Correlation coefficients for 15 student persistence factors, and the factors of ACM study participation, ACM quiz scores, and CCTDI® scores, showing association with the percentage of hours completed

<table>
<thead>
<tr>
<th>Factor</th>
<th>n</th>
<th>r</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>258</td>
<td>.157</td>
<td>.011</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>254</td>
<td>-.001</td>
<td>.985</td>
</tr>
<tr>
<td>Age</td>
<td>258</td>
<td>.006</td>
<td>.929</td>
</tr>
<tr>
<td>(table cont.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Academic Persistence Factors</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------------------------------</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>ACT Composite</td>
<td>258</td>
<td>.201</td>
<td>.001</td>
</tr>
<tr>
<td>Rating of study skills</td>
<td>238</td>
<td>.120</td>
<td>.064</td>
</tr>
<tr>
<td>Number of hours enrolled</td>
<td>258</td>
<td>.114</td>
<td>.068</td>
</tr>
<tr>
<td>Parents’ graduation</td>
<td>238</td>
<td>.011</td>
<td>.863</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Personal Persistence Factors</strong></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of nights out per week</td>
<td>238</td>
<td>-.123</td>
<td>.058</td>
</tr>
<tr>
<td>Hours of TV per day</td>
<td>238</td>
<td>-.110</td>
<td>.089</td>
</tr>
<tr>
<td>Hours spent reading on a daily basis</td>
<td>238</td>
<td>.082</td>
<td>.208</td>
</tr>
<tr>
<td>Residence</td>
<td>244</td>
<td>-.006</td>
<td>.927</td>
</tr>
<tr>
<td>Time spent commuting</td>
<td>244</td>
<td>.003</td>
<td>.961</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Financial Persistence Factors</strong></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Worry about bills</td>
<td>243</td>
<td>.121</td>
<td>.059</td>
</tr>
<tr>
<td>Weekly number of work hours</td>
<td>243</td>
<td>-.111</td>
<td>.083</td>
</tr>
<tr>
<td>Primary source of financial help</td>
<td>240</td>
<td>.013</td>
<td>.846</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>ACM Measures</strong></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ACM quiz scores</td>
<td>236</td>
<td>.254</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>CCTDI® post-test scores</td>
<td>210</td>
<td>.127</td>
<td>.067</td>
</tr>
<tr>
<td>Study participation</td>
<td>258</td>
<td>.069</td>
<td>.270</td>
</tr>
</tbody>
</table>

*Spearman’s rho was used for correlation analysis (Pearson’s r was used for correlation analysis unless otherwise noted).

Note: Variable categories include: Gender, “1 = male” and “2 = female”; Ethnicity, “1 = black,” “2 = nonblack”; Study skills, “1 = needs improvement,” “2 = good,” “3 = excellent”; Parents’ graduation, “1 = neither parent,” “2 = one parent,” and “3 = both parents”; Residence, “1 = family home,” “2 = on-campus housing,” and “3 = off-campus housing”; Financial source, “1 = external sources (scholarships, loans and grants)” and “2 = parents and/or self”; Worry about bills, “1 = no” and “2 = yes.”

ACM quiz, ACT composite and gender were entered (stepwise) into the model. The predictors ACT composite and ACM quiz had a weak correlation with progression, but it was
assumed that a linear relationship existed, based on the logical premise that students with higher ACT scores would be more capable of completing a greater percentage of their courses, and that students who could achieve high scores on the ACM quiz also showed the critical thinking capability for completing a higher percentage of their coursework. Multiple regression analysis (MRA) was selected for analyzing the data. MRA assumes linearity between the outcome of interest and the set of predictors, homoscedasticity of deviations from the line of regression, and normality of residuals. Scatterplots, histograms and casewise diagnostics detect departures from those assumptions, though not necessarily labeling the departures as outliers. To test the assumptions for conducting MRA, specifically for linearity, scatterplots of the raw scores were generated with each of the predictors against progression, and for the normal and predicted residuals. A histogram of the residuals was generated to further depict whether or not the residuals were normally distributed. The resulting regression normal probability plot and histogram of the residuals raised serious concerns about the correct model fit for conducting MRA. Each graph of the original data and residuals indicated that the assumptions of normality and linearity were somewhat violated, and the regression plot of the residuals showed heteroscedasticity of deviation from the regression line (violating the assumption of homoscedasticity). To check for homogeneity of within-group variance, Levene’s test of homogeneity of variance was conducted, for the dependent and independent variables. The results were not significant (p > .05), thus this assumption did not impede the procedure for conducting MRA. The shape of the data on the residuals normal probability plot, depicting a positive skew, suggests that a curvilinear model might offer a better fit. As the ACT scores and ACM quiz scores increased beyond a certain level, the trend shown in the probability plot was a decrease in the expected trend for progression (Figure 7).
Figure 7. Normal probability plot of the standardized residuals for the number of semester hours completed against the predictors of gender, ACT composite, and ACM quiz.

A histogram of the residuals showed a positive skew (1.255) and leptokurtosis (.841), meaning that using a linear model may be inappropriate, since the assumption of normality was of primary concern. The data type for the number of hours completed involved proportions (percentages), which often result in positive skews in data (Osborne, 2006). Entering the percentage value for hours of completion was deemed more appropriate for understanding the output than including a value reflecting the difference between hours enrolled and hours completed. A different calculation may effect the outcome (Figure 8).

Figure 8. Histogram of the residuals for hours completed against the predictors of gender, ACT composite, and ACM quiz.
For a more objective analysis of the assumption of normality, one-sample Kolmogorov-Smirnov test of distribution was conducted. Significance values for hours completed, ACM quiz, ACT Composite, and gender were <.05, which supports that the data were non-normal and that transformation may help to correct the problem. Transformations are often desirable, as the data are compressed, and extreme values are less influential (similar to zooming out with a microscope). According to Hair et al., (1995), when performing data transformation for correcting problems with linearity, homoscedasticity and normality assumptions, there are guidelines for determining which transformation is most appropriate. A researcher can transform the dependent and/or the independent variables by squaring or log transforming the data, or by adding new variables. For left-skewed distributions (which is the case for this data set), to achieve linearity and normality, Hair suggested that the first transformation should be to square the dependent variable (1995). From there, further transformation would include log transformation of the independent variables, inverse of the independent variables, the square root of the independent variables, and lastly to square the independent variables. The different transformations were conducted but only squaring the dependent variable showed a more linear pattern (p-p plot) but did not have a significant impact on correcting for normality (1-sample KS statistic, p <.001). Figure 9 shows the straightening of the regression line when the dependent variable, percentage of hours successfully completed, was squared for the MRA model. The data was compressed, which smoothed the regression line somewhat.

Table 46 shows the model summary with each type of transformation. Squaring the dependent variable resulted in model improvement to a greater degree than the other transformations. All transformations continued to be significant in the amount of variance explained by the predictors.
Figure 9. Normal probability plot of the standardized residuals for the number of semester hours completed (squared) against the predictors gender, Act composite and ACM quiz.

Table 46
Data transformation methods and the impact on the model summary for the predictors ACM quiz, ACT composite and gender, entered into MRA model against percent of hours completed

<table>
<thead>
<tr>
<th>Transformation</th>
<th>r</th>
<th>R²</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untransformed model summary</td>
<td>.329</td>
<td>.108</td>
<td>9.410</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Square of the dependent variable</td>
<td>.364</td>
<td>.133</td>
<td>11.839</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Log 10 of predictors</td>
<td>.321</td>
<td>.103</td>
<td>8.757</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Inverse of the predictors</td>
<td>.334</td>
<td>.112</td>
<td>9.593</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Square root of the predictors</td>
<td>.341</td>
<td>.116</td>
<td>10.192</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Square of the predictors</td>
<td>.309</td>
<td>.096</td>
<td>8.186</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

Note: Order of list is based on recommended order of transformations (Hair et al., 1995).

The most obvious problem with the data, as shown by a example scatterplot of the percentage of hours completed against ACT composite, is the lack of a clear trend in the raw data, and the visibly low correlation (r = 0.201). The scatterplot for ACM quiz was similar, with
no apparent visual trend. The best line fit (unbiased estimate) for using a linear model shows a great loss of data inclusion (Figure 10). Visually, the data “shape” does not offer a recommendation for further analysis.

![Scatterplot of hours completed against ACT composite.](image)

Figure 10. Scatterplot of hours completed against ACT composite.

The original p-p plot suggested a possible curvilinear pattern. To check on that possibility, regression analysis was conducted using curve estimation. The linear coefficient of determination value calculated when running a curvilinear model was $R^2 = .058$ for ACT composite and $R^2 = .067$ for ACM quiz (only one predictor at a time could be entered into the model). Values only increased slightly using a curvilinear model; quadratic, $R^2 = .066$; cubic, $R^2 = .066$ for ACT composite. For ACM quiz, curvilinear values for quadratic and cubic were $R^2 = .068$ and $R^2 = .079$, respectively. The model gains were not great enough to warrant using curve estimation. Adding data to the model would offer the most valuable information about model efficacy.

In the linear, untransformed, model, the three predictors together (ACM quiz, ACT composite, and gender) accounted for approximately 11% ($r = .329$; $R^2 = .108$) of the total variance in percent of hours completed. Casewise diagnostics revealed that there were four
possible outliers that could have influenced the regression statistics, thus the amount of variance
explained. According to Pedhazur (1997), analysis is not impaired to a great degree with fewer
than 5% of the cases identified as influential. But, the points in question should be reviewed
with caution, looking for gaps in distance and influence coefficients, as well as measurement
error. Cases 12 (-3.088), 26(-3.596), 74 (-3.123), and 125 (-3.536) were flagged as suspicious
when the MRA was run. Scrutiny of each case for its influence on the intercept, slope, and each
term in the regression model was checked with Cook’s D, Centered Leverage, and DFBeta. The
Cook’s D value for case 12 was .09408, indicating that it had minimal influence (<.45) on the
calculation of the regression coefficients for the intercept and the slope (leverage = .03239).
Excluding the case would very slightly change the regression statistics, but removal was not
warranted (low DFBeta values of <.021). There were no large gaps in Cook’s D or leverage
values for case 12 or the other identified data points, with values for Cook’s D ranging from
.02508 to .09408, and leverage values ranging from .00366 to .03239. None of the cases had
errors in measurement. Removal for any of the cases was not warranted (all had low DFBeta
values of <.03), as the cases were not suspicious due to measurement error. The cases were
incongruent with the expected trend in response for ACT composite scores and the percentage of
hours that were successfully completed. ACM quiz scores (ranging from 2 – 10) did not show a
trend, and all of the cases identified were for female students (Table 47).

Table 47
Casewise diagnostics for predictors entered into MRA model against percent of hours completed

<table>
<thead>
<tr>
<th>Case Number</th>
<th>SRES</th>
<th>Cook’s D</th>
<th>Leverage</th>
<th>ACT</th>
<th>ACM Quiz</th>
<th>Percent of Hours Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>-3.088</td>
<td>.09408</td>
<td>.03239</td>
<td>23</td>
<td>2</td>
<td>0.01 (table cont.)</td>
</tr>
</tbody>
</table>
From a statistical perspective, the ANOVA source table revealed the acceptability of the regression model. The model was positive, as the F statistic ($F = 9.410$) was significant ($p < .001$). The variability in hours completed due to unknown factors was much greater than the variance due to the predictors. The large gap in the sums of squares calculations confirms the weakness (although significant) of the explanation by the MRA model (Table 48).

<table>
<thead>
<tr>
<th>Model</th>
<th>Sums of Squares</th>
<th>df</th>
<th>F statistic</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression$^a$</td>
<td>1.574</td>
<td>3</td>
<td>9.410</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Residual</td>
<td>12.935</td>
<td>232</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$^a$Predictors entered into model included ACM quiz, ACT composite, and gender.

The intercept of the model was .233 with the inclusion of the predictors, ACM quiz scores, ACT composite, and gender. The calculated coefficients (unstandardized beta value) for each of the predictors indicated the amount of increase in percent of hours completed for each increment increase in the predictor. For the dichotomous variable, gender, increases in the percent of hours successfully completed was more likely for female students. The beta coefficients were small (.073 and below), indicating that changes in the predictors would result in minute changes in the percent of hours completed by the students in the study (Table 49).
Table 49
Regression coefficients for variables included in the MRA model against percentage of semester hours successfully completed

<table>
<thead>
<tr>
<th>Predictor</th>
<th>b</th>
<th>Standardized Beta</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACM quiz scores</td>
<td>.017</td>
<td>.220</td>
<td>.001</td>
</tr>
<tr>
<td>ACT composite</td>
<td>.014</td>
<td>.163</td>
<td>.012</td>
</tr>
<tr>
<td>Gender</td>
<td>.073</td>
<td>.144</td>
<td>.021</td>
</tr>
</tbody>
</table>

Closer observation of the correlation coefficients revealed a slight problem with collinearity. Changes in values, from zero-order to partial and part, means that the predictors share variance. A large change means that there is a large amount of shared variance. None of the predictors had sharp drops in correlation from zero-order, but the change in coefficients at each step in the model indicated that a portion of the variance attributed to one factor was also explained by the other predictors in the model (Table 50).

Table 50
Zero-order, part and partial correlations for the predictors, ACM quiz scores, ACT composite, and gender, in the MRA model against percentage of semester hours successfully completed

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Zero-order</th>
<th>Partial</th>
<th>Part</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACM quiz scores</td>
<td>.254</td>
<td>.218</td>
<td>.211</td>
</tr>
<tr>
<td>ACT composite</td>
<td>.216</td>
<td>.163</td>
<td>.156</td>
</tr>
<tr>
<td>Gender</td>
<td>.121</td>
<td>.151</td>
<td>.144</td>
</tr>
</tbody>
</table>

Collinearity diagnostics showed the percentage of variance that could not be explained by the other factors. Tolerance and Variance Inflation Factor (VIF) statistics were not problems, as
collinearity values were >.9 and VIF values were close to 1.0. Gender had a tolerance value of .999, meaning that less than 1% of the variance accounted for by gender could also be accounted for by either of the other two predictors. Variance inflation factors (VIF) greater than 2.0 are a problem (Hair et al., 1995), with the three predictors having appropriate values at 1.084 and lower. The predictors had eigenvalues close to zero (ACM quiz = .110, ACT composite = .048, and gender = .009), and a condition index for gender of above 20. The collinearity diagnostics indicated that the factors were intercorrelated, and that very small changes in the data values would result in large changes in the beta coefficients (Table 51).

Table 51
Predictor collinearity coefficients and diagnostics for student persistence factors and ACM study participation included in the MRA model against percentage of semester hours successfully completed

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Tolerance</th>
<th>VIF</th>
<th>Eigenvalue</th>
<th>Condition Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACM quiz scores</td>
<td>.923</td>
<td>1.084</td>
<td>.110</td>
<td>5.905</td>
</tr>
<tr>
<td>ACT composite</td>
<td>.925</td>
<td>1.081</td>
<td>.048</td>
<td>8.969</td>
</tr>
<tr>
<td>Gender</td>
<td>.994</td>
<td>1.006</td>
<td>.009</td>
<td>20.704</td>
</tr>
</tbody>
</table>

To address the problem of collinearity, the regression model was run again, this time using standardized scores for the independent variables against hours completed. The overall model fit was not changed ($r = .329; R^2 = .108$). None of the standardized predictors were excluded from the model and their significance levels remained the same. The same four cases (12, 26, 74, and 125) were identified as outliers, and distance and influential diagnostics reaffirmed that the cases did not place undue influence on the regression coefficients. The F statistic in the ANOVA source table remained the same ($F = 9.410; p < .001$). Values for the three predictors were significant at each step in the model ($p < .05$), and correlations (zero-order,
partial and part) were unchanged. Eigenvalues did change, with a value for ACM quiz of 1.023, ACT composite of .955 and gender having an eigenvalue of .727. Condition indices improved, with all predictors having values <2.0 (Table 52).

Table 52
Standardized predictor collinearity coefficients and diagnostics for student persistence factors and ACM study participation included in the MRA model against percentage of semester hours successfully completed

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Tolerance</th>
<th>VIF</th>
<th>Eigenvalue</th>
<th>Condition Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z ACM quiz scores</td>
<td>.923</td>
<td>1.084</td>
<td>1.023</td>
<td>1.125</td>
</tr>
<tr>
<td>Z ACT composite</td>
<td>.925</td>
<td>1.081</td>
<td>.955</td>
<td>1.164</td>
</tr>
<tr>
<td>Z Gender</td>
<td>.994</td>
<td>1.006</td>
<td>.727</td>
<td>1.335</td>
</tr>
</tbody>
</table>

Using linear stepwise MRA, with the three predictors, ACM quiz, ACT composite, and gender, though identified as having a significant but weak correlation with the outcome variable, did not do a good job of explaining the variance in the percentage of semester hours successfully completed by the students in this study. All of the measurements in analysis were plausible, thus the outlying cases were not excluded.

**Objective 5 Results**

Objective five was to determine if there was a good model for explaining a significant proportion of the variance in student persistence, as measured by whether or not the student was enrolled on the 14th class day of the semester following the semester of the investigation, by selected persistence factors and by whether or not they participated in the ACM academic advising system (including the direct measure of the ACM quiz and CCTDI® post-test scores), of undergraduate students enrolled in a four-year public university in the South.
Of the 127 students in the control group, 76.4% (n = 97) persisted to the next semester compared to a persistence rate of 88.5% (n = 116) for the ACM treatment group of 131 students. The overall persistence rate was 82.6% (n = 213) for all the students in the study.

As a foundational process for conducting logistic regression, relationships were determined for persistence and the items on the persistence factors questionnaire, ACM participation, and the direct measures of ACM quiz and CCTDI® post scores. Correlation analysis was run on 258 cases for persistence, but with fewer cases included when correlated against variables with missing data. Based on different types of correlation analysis (correct for data type), the relationships with persistence that were identified as significant, but weak, existed for five factors (gender, ACT composite, ACM study participation, ACM quiz, and CCTDI®) with the strongest relationship with the ACM quiz (r = .193, p = .003). The factor least related to persistence was the number of hours the students spent watching television on a daily basis (r = .001; p = .982) (Table 53).

**Table 53**
Correlation coefficients for student persistence factors, ACM study participation, and ACM quiz and CCTDI post-test scores against persistence in the university

<table>
<thead>
<tr>
<th>Factor</th>
<th>n</th>
<th>r</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethnicity^a</td>
<td>254</td>
<td>.012</td>
<td>.852</td>
</tr>
<tr>
<td>Age^b</td>
<td>258</td>
<td>.049</td>
<td>.430</td>
</tr>
<tr>
<td>Gender^c</td>
<td>258</td>
<td>.135</td>
<td>.030</td>
</tr>
<tr>
<td><strong>Academic Persistence Factors</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACT composite^b</td>
<td>258</td>
<td>.136</td>
<td>.028</td>
</tr>
<tr>
<td>Number of hours enrolled^b</td>
<td>258</td>
<td>.077</td>
<td>.218</td>
</tr>
</tbody>
</table>

(table cont.)
<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>r</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-rating of study skills</td>
<td>238</td>
<td>.137</td>
<td>.107</td>
</tr>
<tr>
<td>Parents graduation from college</td>
<td>238</td>
<td>.050</td>
<td>.739</td>
</tr>
<tr>
<td><strong>Personal Persistence Factors</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of daily hours reading</td>
<td>238</td>
<td>.050</td>
<td>.441</td>
</tr>
<tr>
<td>Number of nights out each week</td>
<td>238</td>
<td>-.069</td>
<td>.290</td>
</tr>
<tr>
<td>Number of daily hours of TV</td>
<td>238</td>
<td>.001</td>
<td>.982</td>
</tr>
<tr>
<td>Residence</td>
<td>244</td>
<td>.046</td>
<td>.776</td>
</tr>
<tr>
<td>Time spent commuting</td>
<td>244</td>
<td>.028</td>
<td>.666</td>
</tr>
<tr>
<td><strong>Financial Persistence Factors</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worry about paying bills</td>
<td>243</td>
<td>.118</td>
<td>.065</td>
</tr>
<tr>
<td>Number of weekly work hours</td>
<td>243</td>
<td>-.094</td>
<td>.145</td>
</tr>
<tr>
<td>Primary source of financial help</td>
<td>240</td>
<td>.021</td>
<td>.748</td>
</tr>
<tr>
<td><strong>ACM Measures</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACM quiz scores</td>
<td>236</td>
<td>.193</td>
<td><strong>.003</strong></td>
</tr>
<tr>
<td>ACM Study participation</td>
<td>238</td>
<td>.160</td>
<td><strong>.010</strong></td>
</tr>
<tr>
<td>CCTDI® post-test scores</td>
<td>210</td>
<td>.139</td>
<td><strong>.044</strong></td>
</tr>
</tbody>
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<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>a</td>
<td>Correlations calculated with Cramer’s V.</td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>Correlations calculated using Pearson’s r.</td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>Correlations calculated using Phi.</td>
<td></td>
</tr>
</tbody>
</table>

Further analysis was performed using logistic regression, as the dependent variable was a binary categorical measure. The two primary uses of logistic regression are to predict group membership and to account for the percent of variance in the dependent variable attributed to the predictors. The model calculates the probability of success or failure, giving results in the form of an odds ratio. The binary variable is coded as either a zero or one, so that the mean of the distribution will always be equal to the proportion of ones. The mean and the probability are the same for logistic regression analysis with a binary dependent variable. The proportion of ones is
interpreted as success (P), and the proportions of zero as failure (1-P). The regression line using logistic regression is not linear, but has a sigmoid shape (S or Z), and plots the mean of the dependent variable, or proportion of ones, as a “rolling mean” (Hair, 1995). All data points will lie at zero or one on the y axis, and with accuracy in predictions, the trend of the regression line will shift at .5. The sigmoid curve in the regression line relates the predictors to the outcome. Logistic regression computes the odds that an event will occur or not occur, with values lying between zero and infinity (propensity values). For this reason, log odds are calculated so that positive (odds in favor of an event occurring) or negative (odds against an event occurring) values can easily be interpreted and symmetrical around zero (Brace et al., 2003).

The initial model for conducting logistic regression analysis included the dependent variable, persistence, with five predictors entered as a block for determining the coefficients for the predictors, whether or not they were significant after entry in the model. Each predictor (ACM participation, ACM quiz, ACT composite, gender, and ethnicity) generated a -2log likelihood value. The model holds the assumption that the propensity for a certain outcome is linearly related to the predictors. The results report the most accurate prediction with the variables involved. Five approximations (iterations) were performed for arriving at the best solution (maximum likelihood). Maximum likelihood is a loss function that produces the least squares estimate for minimizing error. Probability is not exact, so likelihood indicates (through a series of approximations) the most accurate analysis, based on the predictors included in the model (Hair et al., 1995). Iterations were continued until the estimates did not change enough to warrant continuing (change of < .01). Before including the predictors, the initial -2log likelihood value was 153.056 (based on six iterations), with the coefficient of the constant at 1.996. This information by itself has no inherent meaning for the analysis, but served as the baseline for
determining the change in the model after the six predictors were entered (Brace et. al., 2003). To check for the adequacy of model fit, three statistical tests confirm or dispute the fact. The Omnibus test of model coefficients shows the difference in -2log likelihood values from the intercept-only analysis and the value to the model when including predictors. A significant change indicates a good model for the data (Brace et al., 2003; Hair et al., 1995; Pedhazur, 1997). Step zero of the Omnibus test, with a chi square coefficient of 15.294 (p = .009), supported the model for this data set. Another check for model fit is the Hosmer and Lemeshow test, which tests the null hypothesis that the model is a good one for the data, is considered the most reliable test of model fit. To calculate the Hosmer and Lemeshow $\chi^2$ statistic, the predictors included in the model (based on continuous data) are grouped into deciles and aggregated data is displayed in a contingency table. The $\chi^2$ statistic was 4.322 (p = .827), which confirmed that the model adequately fits the data. The Wald statistic indicates which of the predictors fit well in the model. This test also indicates the degree of impact each predictor has on the probability of the outcome, much as beta coefficients in linear regression indicate the amount of change in the dependent variable by a unit change in the predictor variable. When all of the predictors were calculated in the model, none of the predictors were significant (p >.05). Table 54 displays the regression coefficients for each of the predictors entered into the calculations, the Wald statistic, level of significance (alpha at .05), and the odds ratio. Odds ratios <1.0 indicate that the likelihood of achieving the outcome of interest will decrease by that factor, with a unit change in the associated predictor.

Table 54
Logistic regression coefficients, Wald statistic and significance, and odds ratio for predictors entered in the model against persistence in the university

<table>
<thead>
<tr>
<th>Factor</th>
<th>b</th>
<th>Wald</th>
<th>p</th>
<th>Exp(B)</th>
</tr>
</thead>
</table>

169
The significance of the Wald statistic was confirmed by the significance of the change in -2log likelihood value ($\chi^2 = 6.283, p = .001$). The significance was calculated for the intercept only model. Linear regression analysis includes the coefficient of determination for measuring overall model effectiveness. Logistic regression has a similar coefficient that is derived from the iterations (repeated adjustments) for estimating the best model fit. The model summary, for all predictors entered, includes the Cox & Snell $R^2 (.071)$ and the Nagelkerke $R^2 (.136)$. The two values indicate that the predictors explain somewhere between 7% and 13.6% of the variability in student persistence in the university (logistic regression does not offer the level of accuracy as does linear regression). The percent of correct predictions for persistence, using all predictors, was 100% ($n = 184$), with 0% correct predictions for non-persistence, and overall model accuracy of 88%. There were 209 cases included in the analysis, with 49 missing cases (loss of cases was due to the number of students who did not complete the CCTDI® post-test).

The analysis was run again, using Forward Likelihood Ratio (stepwise entry) to generate the model summary with the inclusion of only the significant predictor(s), for confirming or disputing the block entry method. The initial -2log likelihood value was 153.056 (coefficient value of 1.996), with a significant Wald statistic ($87.692, p < .001$) for the initial intercept-only equation. The significance values of the predictors, and the iterations ($n = 5$) performed for
estimating the best model, resulted in the inclusion of ACM study participation as the sole predictor (p = .001). There was a 6.283 change (p = .012) in the -2log likelihood value (146.772). The values generated in the model summary for explaining the variability in persistence decreased from the first solution. Cox and Snell ($R^2 = .030$) and Nagelkerke ($R^2 = .057$) suggested that approximately 3% to 6% of the variability in persistence is accounted for by participation in the ACM study. Hosmer and Lemeshow $\chi^2$ statistic was not generated, as there were no deciles of data (independent variable was dichotomous). Of the 184 students who persisted, the model’s accuracy was 100%. For the 25 who did not persist, the accuracy of the predictions was 0%. The overall accuracy was 88%. There were 15 misclassified cases that were identified with standardized residual values of -3.780. Because of the dichotomous nature of the dependent and independent variables, all of the Cook’s D and Leverage values were the same, and all cases were calculated with one of the four possible values (.0006, .00212, .04620, or .13477). The last listed value represented students in the ACM treatment group who did not persist. All misclassified cases were predicted to persist, with a predication value of .935.

With ACM participation as the sole predictor included into the equation, the regression coefficients for ACM participation improved, indicating that there was collinearity among the variables. When ACM participation was entered into the model, excluding the other predictors, the significance values for the other variables changed to >.05. Model significance improved (p = .017), $b$ increased to 1.119, the Wald statistic showed more than 50% improvement in the usefulness of the predictor (5.682) and the exp(B) increased to 3.061, indicating that the odds of persisting for a student who actively participates in the ACM activities are 3.061 times greater than the odds of persisting for a student who does not experience the ACM instrument.
CHAPTER 5

FINDINGS, CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

Summary

The purpose of this study was to determine the effects on academic performance (semester grade point average, percentage of hours completed for hours enrolled, and persistence in the university), for freshman students in a four year public university in the Southern portion of the U.S., of participation in activities involving the Academic Concept Mapping instrument. The specific objectives for the study involved both immediate measures of the ACM instrument’s effectiveness, as well as semester outcomes. The five objectives included:

1. To describe the students enrolled in the selected freshman seminar course sections on age, gender, ethnicity, and by educational, personal, and financial persistence factors, of undergraduate students enrolled in a four-year public university in the South by whether or not they participated in the ACM academic advising system.

2. To compare, for the purpose of providing preliminary results, the propensity for incorporating critical thinking skills, as measured by the California Critical Thinking Disposition Inventory (CCTDI®), and the ability to apply critical thinking skills, as measured by the ACM quiz, among undergraduate students enrolled in a four-year public university in the South by whether or not they participated in the ACM academic advising system.

3. To determine the correct model fit for explaining a significant proportion of the variance in students’ academic achievement, as measured by semester grade point average, by selected persistence factors and by whether or not they participated in the ACM academic
advising system, of undergraduate students enrolled in a four-year public university in the South.

4. To determine the correct model fit to explain a significant proportion of the variance in student progression, as measured by the percentage of scheduled courses completed, by selected persistence factors and by whether or not they participated in the ACM academic advising system, of undergraduate students enrolled in a four-year public university in the South.

5. To determine the correct model fit to explain a significant proportion of the variance in student persistence as measured by whether or not the student was enrolled on the 14th class day of the semester following the semester of the investigation, by selected persistence factors and by whether or not they participated in the ACM academic advising system, of undergraduate students enrolled in a four-year public university in the South.

The Academic Concept Mapping study targeted first-semester freshman students, entering the university in the fall of 2006. The platform for conducting the study was a freshman seminar course, in which students self-selected and self-enrolled, after orientation advising. A total of 258 students were included in the study, with ages ranging from 17 to 24, and were enrolled in credit hours ranging from 6 to 19. The students gave consent to participate in the study, and were free to withdraw their information from the study data, but not from participation in the class activities. The ACM study replaced class activities for the treatment group for the five class sessions necessary for completing the instrument. All of the students in the study completed a persistence factors questionnaire, completed an ACM quiz, and completed
the CCTDI® post-test. Half of the treatment groups and half of the control groups completed the CCTDI® as a pre-test.

Three instructors agreed to participate. Each teacher went through a rigorous training process, with ongoing contact with the researcher throughout the study. Materials, including full scripts for dialogue with the students, were provided. Data were collected, entered into SPSS and analyzed. The instructors provided additional information, when noted, on any unusual behaviors, frequent absenteeism, etc.

A four-group design was selected for the quasi-experimental study for three purposes: 1) to control for the testing affect that may have occurred with the CCTDI®, 2) to serve as a covariate for equating groups, since full randomization was not conducted, and 3) to obtain immediate and direct measures of participation in the ACM study. The design of the study, the intensive training and ongoing interactions with the course instructors, controlled for the threats of testing, instrumentation (instruments were not changed, and rater-bias was a targeted issue in the training procedures). Maturity was not considered an issue as the study took place in one semester. Descriptive analysis indicated that statistical regression was not a threat, as the profiles for the 12 class sections were checked for extreme scores on each of the variables of interest. There were no events reported by the instructors that would lead to the conclusion that contemporary history posed a threat. Selection was not based on the full power of random assignment; however, the class sections were randomly assigned to the instructor and to the level of treatment. Mortality was not considered differential, overall, with the number attrited ranging from zero to eight in the sections (average of 4 per section), with a total of 48 students dropping-out at some point in the study (either before the ACM quiz, before the CCTDI® post-test, or both).
Findings, Conclusions, Implications

Objective 1 Findings: The composite profile of the sample group had several interesting features which were aligned with the literature review of entering freshmen (i.e., willingness to take on greater debt and responsibility for bills, first-generation college students, and high percentage of attrition in the first few weeks of the semester). There were 42 students who enrolled in the freshman seminar class who never attended and were excluded from the study. Beyond that number, another 48 out of the 258 students attrited at some point during the semester (22 before the ACM quiz and 26 after). Student attendance was sporadic, so the best estimate of mortality was the student count during data collection points (CCTDI® pre and post-tests and the ACM quiz). Overall, the demographics found were not surprising, but the lack of a clear relationship to academic performance presents cause for further thought.

The students comprising the study were over half female (58.9%), were predominantly white (57.5%), (there was twice the percentage of black students in the study group than there was in the university profile for entering freshmen), and most were 18 years old (63.6%). Findings from the personal persistence factors were that the students lived mostly in the family home (37.7), but with on-campus housing (37.3%) a very close second. The students watched, on average, two hours of television on a daily basis (27.7%), which was below a reported national mean of 4.5 hours a day (CNN, 2006). Two students reported watching television 10 hours a day, which may have included other activities using the television as a monitor (internet use, video games, etc.). The average student spent very little time reading during the week (over 60% reported <2.0 hours per week) and 18% reported not reading at all. A large percent of the students went out every night of the week to socialize with friends (34.1%). The opposite was true for nine students (3.5%), who reported never going out for socializing. Students who lived at
home went out less often during the week than did students who lived on campus. Going out at night had an inverse relationship with the number of hours watching television and the hours spent reading. Students who lived in off-campus housing went out less often than the other groups. The students who lived at home reported longer commute times than did the students who were living in off-campus housing, with the average time for commuting reported at 15 minutes. About 17% reported commute times over 30 minutes (one student reported a commute time of an hour and a half).

Information from the academic persistence factors revealed that the average ACT composite score was 20.5, with over 60% of the scores between 18 and 21. More students enrolled in 16 semester hours (32%), but with 87 students enrolled in more semester hours (up to 19). For the most part, students rated their study skills as good (49%), with few (11%) claiming excellent skills. When asked about their parents’ level of education, as measured by college graduation, most students reported that neither parent had a college degree (63%). Typically, when students reported that a parent had graduated, it was both rather than only one (27%).

Summaries from the financial persistence factors revealed that many students have debt for which they are responsible. Almost 69% of students reported that they worried about paying monthly bills; which could stem from an initial lack of money or from overspending. Almost 39% of the students reported that they did not work at all, but those who did, on average, worked approximately 14 hours per week. Only 42 students in the study worked more than 30 hours a week. Students who lived at home worried more about bills than students who lived on campus. Less than half of the students who lived in off-campus housing reported that they worried about money (bills). Regardless of the other factors, most college costs were paid for by external sources, with less than 1% of the students reporting that their parents paid for college. Parents,
self, and loans (exclusively) were all infrequently reported primary funding sources at <2%.
External sources were usually combined to pay for college (80%). With selecting a sole external
source for college expenses, most students reported TOPS (8.3%).

Objective 1 Conclusions: The study sample was similar enough to the overall freshman
class that results are considered generalizable to entering freshmen in similar semesters with
similar settings and dynamics. There were no key features identified that made this group
unusual as compared to first-time freshmen in four-year public universities.

Many studies have shown that lack of reading and poor reading skills are major risk
factors for academic success. The fact that these students reporting reading, on average, two
hours each week, were enrolled, on average, in 16 credit hours, and reported study skills that
needed improvement obviously contributed to the correlations between those factors and
academic outcomes. However, the fact is that over 80% of the students persisted, over 72%
earned a semester grade point average of at least a 2.0 (good academic standing), and over half
of the students successfully completed at least 80% of their courses.

Less than 1% of the students relied on parents as a sole source of paying for college
expenses, but reported reliance on a combination of external funding sources (scholarships
and/or grants and loans). Whether or not the parents were college graduates did not appear to
make a difference for the students in this study for academic success, as most of the students
reported neither parent having a degree, yet most of the students in the study persisted, had
adequate grade point averages, and a substantial number of students completed a high percentage
of their courses.

Objective 1 Implications: First and foremost, students should receive assistance from an
academic advisor, before registering for classes, for selecting an appropriate course load, course
levels, and combinations of courses based on academic, personal and financial dynamics (ACT composite, rating of study skills, number of hours worked, financial obligations, etc.). Student attrition occurs for various reasons, and without an individual plan developed for each student, persistence, progression, and semester grade point averages will be jeopardized.

The fact that twice the percentage of black students were enrolled in the freshman seminar course in comparison to the entire entering freshman class could be an indication that black students were more inclined to seek early help in the university setting. The freshman seminar course was promoted as targeting key success issues for new college students. It may also indicate that a higher percentage of black students wanted a “breather” course to balance more difficult courses.

Students completed the persistence factors questionnaire at the beginning of the semester, before they experienced any transitioning issues associated with college life. Had they completed the questionnaire later in the semester, many answers may have been different, and possibly more associated with the semester outcomes. For instance, money management and time management demands change from high school to college. Worry about paying for monthly expenses often occurs when students fall prey to credit card sales pitches. Students often find that study skills aren’t adequate for college level courses and allow limited time for building the necessary skills during the first semester. The expected outcomes for students, based on persistence factors identified through research and established as theoretical postulates, and the actual outcomes were surprisingly different; which serves as a strong foundation for further analysis of the most relevant persistence factors that may influence the effectiveness of the ACM system for improving academic outcomes. Broadening the scope of persistence factors
on the questionnaire and adding items that target psychosocial factors may provide greater insight into the profile of entering college freshmen.

**Objective 2 Findings:** The second objective focused on analyzing two foundational questions: 1) was the CCTDI® a valid and reliable measure of the propensity for using critical thinking skills for the students in the study, and 2) did the students in the ACM treatment group develop and apply critical thinking skills to a greater degree than did the students in the control group?

The California Critical Thinking Disposition Inventory, CCTDI®, purported to measure propensity for critical thinking on through 75 items on seven subscales. Responses from students were from a 6-point, Likert-type scale, with “1 = agree strongly” through “6 = disagree strongly.” An initial analysis of variance was conducted to compare the post-test scores for the students in the treatment group with those in the control group. The outcome showed there was no significant difference for the groups (p = .726). Analysis of covariance was conducted, using the pre-test as a covariate (r = .798), with the same outcome; non-significance (p = .281). The more immediate measure of applying critical thinking skills, the ACM quiz, did not concur with the non-significance of the CCTDI®. Comparing groups on the ACM quiz scores showed a significant difference (p < .001).

After administering a standardized instrument, confirmatory factor analysis is generally conducted. There was not enough published data on the CCTDI®, a relatively new test, and the test developers did not release requested information on item analysis. To establish if the student responses loaded on the seven subscales as stated by the test developers, exploratory factor analysis (EFA) was conducted (principle axis factoring, with Promax rotation). Most of the 75 items for the data set had initial intercorrelations of <.3. According to Brace et al., (2003),
having a substantial amount of the correlations >.3 is the first consideration. Garson (2007) warned of the possible distortions in data when conducting EFA using ordinal level data. The number of responses, 328, may have been inadequate for running the analysis, as Pedhazur (1997) stated that a minimal standard is a ratio of five responses for each item on an instrument. Garson (2007) posited that a sample of 300 or more is adequate for most instruments. Whether or not the initial correlations would have improved by adding data cannot be determined. The weakness of the correlations impacted the remainder of the analysis. Three of the four statistical values for justifying the use of EFA were supported (excluding the initial intercorrelations); the partial correlations were small, Bartlett’s test of sphericity indicated that there were adequate correlations for factorability (p <.001), and the overall measure of sampling adequacy (.775) was acceptable, with item values (all but two) >.5. One of the items with low MSA was deleted, the other was not, based on the changes that occurred in overall statistics with their removal (one at a time), specifically extracted communalities. The initial run of EFA, with latent root criterion being eigenvalues of 1.0 and higher, resulted in the extraction of 24 factors. Even with the 24 extracted factors, the explanation of the variation in the original items was only 64%. Factor extraction was forced for several different trials to determine the best model. Extracting three through seven factors took into account the visual support of the scree plot (which showed only three factors on the steep slope), the test developer’s original claims, and the number and strength of factor loadings on each extracted factor. For models extracting more than three factors, the last factor had few items loading (four and less), with low loadings, and increasing numbers of items that cross-loaded on factors. The model with seven extracted factors had 14 cross-loadings, with only two items loading on factor seven. It was determined that three factors was the most parsimonious model, based on the above criteria. The amount of variance in the
initial items explained by a three-factor model was 23.7%, with extracted communality values ranging from .026 to .451, and eigenvalues above 3.0. The first factor, with the inferred label of “Open-mindedness,” had 17 differentiated loadings (one cross-loading), with values ranging from .337 to .639, factor two, “Systematicity,” had 13 loadings (four cross-loadings) with values from .320 to .636, and the third extracted factor, “Maturity of Judgment,” loaded with seven items and one cross-loading, with values from .330 to .531. The overall mean for the Open-mindedness scale was 4.28 (SD = 1.41), the mean for Systematicity was 3.09 (SD = 1.37), and the mean for Maturity of Judgment was 2.50 (SD = 1.32). The first two factors insinuate ambiguity with a slight tendency to agree or disagree. The last factor, Maturity of Judgment, showed greater decisiveness in student response. The only correlation among the extracted subscales was for Systematicity and Maturity of Judgment (r = .415). Reliability values, with calculations generated using Cronbach’s Alpha measure of internal consistency, were .826 for Open-mindedness, .728 for Systematicity, and .678 for Maturity of Judgment.

One of the purposes for administering the CCTDI® was to serve as an immediate measure of the difference in pre and post-test scores, but with interest in an indirect connection between the instrument and the application of critical thinking skills necessary for successfully completing the semester. With further-reaching purpose in mind, the post-test scores, and the three extracted subscales were checked for correlations with the outcomes of interest; semester grade point average, persistence, and progression. The CCTDI® post-test was significantly correlated with semester grade point average and persistence (r = .149). None of the extracted subscales were significantly correlated with the outcomes.

**Objective 2 Conclusions:** The activities and critical thinking skills (analytical reasoning, projection, rational problem solving, etc.) involved in the ACM study culminated in the
presented scenarios and the application of critical thinking skills measured on the ACM quiz. The treatment group’s mean score was significantly higher than the mean for the control group (p < .001), showing that the ACM instrument was effective in teaching the application of critical thinking skills in the academic scenarios targeting grade point average, persistence and progression dynamics. The CCTDI® post-test scores did not show a significant difference, though it should be noted that the groups were dissimilar on the pre-test measures (p = .011). The pre-test mean was higher for the control group (M = 285.379, SD = 29.6830), with a drop in mean for the post-test (M = 274.882, SD = 30.3639). The scores for the treatment group showed the expected increase (pre-test M = 271.220, SD = 29.5903; post-test M = 273.481, SD = 27.4354), with an important feature being a smaller standard deviation for the final scores (tighter cluster around the mean). That indicates that the students in the treatment group were less sporadic in their responses. The original gap between the pre-test scores was lessened for the post-test scores, making the test appear non-conclusive and nonsignificant. The trend of change for both groups implied that the ACM study activities did have a positive impact on the propensity for incorporating critical thinking skills. The extracted subscales were not different for the Open-mindedness and Maturity of Judgment, but they were significantly different for Systematicity (p = .031). When drawing conclusions about the CCTDI® outcomes, two concerns must be highlighted; one, the ratio of 5:1 was not met, and two, there is little evidence from past research to support the test developer’s conclusions (number of scales, reliability coefficients, and item analysis) for the CCTDI®.

Objective 2 Implications: Historically, the freshmen seminar class has targeted academic performance issues and student success strategies. That fact, in and of itself, can be considered a semi-intrusive process. The course, which has established itself as a retention tool, delivers key
information to students, increasing their awareness of success strategies. The researcher incorporated the ACM instrument in the course based on the knowledge that the control group would still benefit from quality information provided in the course. The different experiences and study outcome for the students enrolled in the sections following the traditional format and those in the ACM instrument sections were based on the structure, delivery, timing, and practice of the material. The ACM instrument, a highly intrusive and comprehensive system, not only targeted the key issues, but provided graphic illustrations of the linkage in concepts that were identified by the students about themselves and university policies and procedures. The ACM instrument provided a structured framework for anticipating and analyzing consequences. Students were guided in applying critical thinking skills through skillful questioning by the course instructor. Information was not merely provided, but discovered and processed for far-reaching affects. Ultimately, a rational decision-making process was honed for application to possible academic situations that may require action from the student. Students demonstrated the ability to identify success strategies and make rational decisions on the ACM quiz. It’s quite an accomplishment that the ACM instrument resulted in a significant difference for the groups, when the students were already benefiting from enrolling in a course that historically showed higher persistence rates. Freshmen students benefit from intrusive, comprehensive, and highly structured activities as presented in the ACM instrument.

**Objective 3 Findings:** There were nine factors significantly correlated with semester grade point average (ACM participation, gender, CCTD® post-test scores, ACM quiz scores, ACT composite, hours worked each week, number of hours of enrollment, hours spent reading, and worry about paying monthly bills) and were entered into a stepwise multiple regression model to determine the correct model fit for explaining a significant proportion of the variance in
semester grade point average. Six factors were retained in the model (ACM participation, gender, ACM quiz scores, ACT composite hours spent reading, and worry about paying bills), and as a whole, they did a good job of explaining the variance in semester grade point average, accounting for approximately 35%. The model detected six suspicious cases, but diagnostic values did not warrant removal. Measurement error was not a contributing factor, as it is possible for students with high ACT scores to end the semester with an unsatisfactory grades.

Multicollinearity was an issue, evidenced by low eigenvalues (close to zero) and high condition indices (>10.0), though tolerance and VIF values were adequate (>0.8 and <2.0, respectively). Standardized scores of the predictors were calculated to address problems with collinearity, and the model was run again with the six standardized predictors, resulting in improved collinearity values. One predictor, hours spent reading, was dropped from the model. Eigenvalues and condition indices improved, but overall model fit changes, showed a reduction in correlation ($r = .523$) and the proportion of variance explained decreased to 27% ($R^2 = .273$).

Objective 3 Conclusions: Semester grade point average was affected by multiple factors, but with ACT composite, ACM quiz scores, and ACM study participation presenting the best values in the model. Those predictors had the highest eigenvalues and lowest condition indices, indicating that they were less intercorrelated with the other factors and contributed greater explanation to the model. Although hours spent reading was dropped from the model because of the strong collinearity, the very fact that it is so strongly related to the other factors shows its overall importance. The ACM study, ACM quiz, and ACT composite all involve critical thinking skills, which are necessary for college success. Students who enter the university with high ACT composite scores are expected to perform better, and are given the opportunity for entering higher level courses, requiring more advanced critical thinking skills, based on that one
feature. Without the additional work of the ACM activities (ACM quiz is the final activity), the ACT composite alone was not a good predictor for the students in the study. ACT composite does not take into account the lived experiences of the students during that crucial first semester. The intrusive, comprehensive, and proactive nature of the ACM instrument, coupled with the student’s natural abilities increased the likelihood of academic success. Students who experienced academic concept mapping were better able to gauge their academic performance in each class and to take action in a timely manner.

Gender and worry about paying monthly bills were also identified as significant factors that accounted for variance in grade point averages. Female students, overall, exhibited higher achievement during the first semester than did male students. Gender was not related to ACT composite scores, which was the predictor most correlated with semester grade point average, nor with any of the other persistence factors, so that was not the issue. It is more likely that female students, of traditional age, are more mature than males of the same age and have developed better study habits in high school. Another explanation could be that the learning styles of women and men are inherently different. According to Holland (1997), 70% of “Realistic” personality types (i.e., learn through demonstration; action-oriented; natural inclination for physical involvement) are males, and the inverse of that is true for “Social” personality types (i.e., process information through verbalization interaction; interest in teaching and helping others; natural tendency to disclose information), with 70% female. Based on those descriptors, females may be more likely to engage in study groups, may approach professors to ask questions, and may seek timely help for course difficulties or emotional issues (test-taking anxiety) at a higher rate. The typical college lecture format for information delivery may be more congruent with the natural styles of female students, where the male students may be more
engaged in courses requiring a “hands-on” approach. Male students may not want to admit to having difficulty, especially of an emotional nature.

Worry about paying bills was also a contributing factor to the model. Students who are responsible for bills, and who worry about paying those bills have a divided focus – school and work. When students are in the college environment and they experience financial struggles, they experience academic difficulties as well (Hossler, Schmit, & Vesper, 1999). Parents who do not provide monetary support for indirect expenses increase the likelihood of the student’s dropping-out for financial reasons (needing to work). As the number of hours of work increase, grade point averages decrease. Work may take precedence over study time and thus affect the grade point average. Students employed in excess of 25 hours per week are more likely to drop out of college due to financial obligations (Tinto, 2002).

Objective 3 Implications: Based on the model summary for the predictors of success in grade point average, advisors should be alerted for planning effective interventions for their students. First semester issues are critical for the student’s continuing in college (Tinto, 2002). With proactive strategies in place, such as the ACM instrument, grade check points and required one-on-one meetings, there will be less opportunity for male students who are experiencing difficulties to go unnoticed. Knowing that freshmen males are at special risk can allow advisors to work with them to plan strategies for balancing work, honing study habits, and developing good time management skills.

Advisors need to make students aware of sources of funding available whenever possible and also the need to prioritize their responsibilities (time and money management). A new car might be nice, but paying the monthly note and insurance while in college could have a negative impact on their academic success and consequently future potential earnings and economic well
being. Strategies for helping students who are experiencing financial struggles might include helping them create a budget and possibly find work on campus. Campus jobs often allow students flexible time for academic obligations and promote participation in an intellectual environment.

Freshman students need guidance in developing the critical thinking skills necessary for academic achievement. The ACM study activities and the ACM quiz did just that. Students with high ACT composite scores, and who also participated in the ACM activities, scored higher on the ACM quiz (a collection and hierarchy of critical thinking skills) and achieved higher grade point averages. That makes sense. However, even with lower ACT composite scores, the premise should be the same; students will benefit from participation in academic advising strategies that directly target and model how to process issues and situations that present during the first-year of college. Teaching the application of critical thinking skills concerning first-year issues, especially causal analysis and projection, is essential for students to understand and make rational decisions. The results of the study showed that for students who are actively engaged in the processes of forecasting and predicting outcomes from a seemingly minor and immediate decision are better prepared to postpone activities that interfere with college success. The first semester of college is a transition that can be overwhelming for many students. During that semester, the issues should be addressed intrusively (not waiting for the students to ask the questions or disclose problems), systematically, and actively. The ACM instrument was constructed with that approach in mind.

Objective 4 Findings: There were only three factors significantly correlated with the percentage of hours successfully completed for the semester (progression); ACM quiz scores, ACT composite, and gender. They were entered as independent variables into a multiple
regression model, stepwise, to determine the best model fit for parsimoniously explaining the proportion of the variance in progression. All three were retained in the model but collectively did not do a good job of explaining the variance in progression, accounting for slightly over 10%. The model detected four possible outliers (studentized residuals >3.0), but casewise diagnostic tests did not warrant removal. Measurement error was not an issue, as it was entirely possible for students with a spectrum of profiles to complete all or none of their classes.

Tests for assumptions suggested that a curvilinear pattern might offer a better model fit than linear regression for explaining progression. To test the linear model further, data were transformed using a variety of techniques (square of the dependent variable, log transformation of the predictors, inverse of the predictors, square root and square of the predictors), but none resulted in a smooth, linear regression line. Curvilinear estimations were a little better than linear, but not substantially (average gain for predictors was <.02). Multicollinearity was a problem showing low eigenvalues (close to zero) and high condition indices (>10.0). Tolerance (all >.9) and VIF values (all <2.0) were good. Collinearity was addressed by standardizing the scores of the predictors and the model was run again. Collinearity values were virtually unchanged, except for eigenvalues and condition indices, which improved (.727 and 1.335, respectively). Overall model fit ($r = .329$, $R^2 = .108$), correlation coefficients and the ANOVA statistics ($F = 9.410$, $p = <.001$) remained the same. The model revealed that for this sample group, students with higher ACT scores, female students, and those who scored higher on the ACM quiz were more likely to complete a greater percentage of their classes.

**Objective 4 Conclusions:** Progression in a curriculum is defined as the percentage of hours completed out of those registered for the semester, and is a personal and individual attainment. If a student registered for six hours and completed three, the percentage calculated
was the same as for a student who registered for 18 hours and completed nine. Using percentages is somewhat misleading in that respect, but is effective when used as an indicator of success in the individual plans and timelines set by each student. For example, one student, based on personal circumstances, may decide that he or she can handle a nine-hour course load, with the full awareness that the degree completion will require seven years of college, based on 100% course completion each semester. Another student may successfully complete nine hours in a given semester, but registered for 15. The measurement for semester success will be different; and determination of progression for the two examples is based on the original goal. Progression in a curriculum should be based on clarified and intentional goals. Even though both students completed nine hours, the second is more likely to be experiencing academic difficulties.

It’s important to note that pre-registration advising efforts that took place before the fall 2006 classes began, for the beginning freshmen involved in this study, were not controlled nor measured for effectiveness. Students met with advisors in group sessions for one hour before they had access to the registration system. They were given general guidelines and recommended courses. Students wrote courses on an advising form, advisors signed and collected a copy, gave a copy to students who then departed for a computer where they could register for classes. The students were not accompanied nor were they monitored while registering classes. Students who registered for below full-time (<12 hours) were as likely to complete less than 50% of their classes as were students who enrolled in more than 16 credit hours, with females completing a higher percentage of their course loads.

Students with higher ACT composite scores were more likely to complete a greater percentage of their courses, until the course load exceeded 16 credit hours; then the relationship
mirrored that of students with lower ACT composites. Students who register for less than full-time course loads and who completed a low percentage of their courses may be expressing a lack of commitment or lack of confidence in earning a degree, or who are working too many hours to register as full-time students. Students who register for more than 16 or 17 credit hours may be unrealistic in their expectations of college level course work and their academic preparedness.

The fact that female students enrolled in more hours and completed a higher percentage of their courses, just as with semester grade point average, indicates that the females in this study entered the university with a different set of expectations, preparedness, maturity, or a combination of those qualities. Young female students as a whole, may still enter the university with socioculturally acceptable and pre-defined occupational goals, which reduce stress over selecting a college degree (Nursing, Education, Family and Consumer Sciences, Speech Pathology, etc.). Crites (1969) stated in his earlier work that females exhibit a higher level of career mature cognitions in the process of vocational development. While the world-of-work offers a broader range of occupational options, and has been more accessible for females, a high percentage of students entering into the programs mentioned above are female, and the more technical fields in higher education continue to draw more male students (Holland, 1997).

The ACM quiz was a culminating event in the ACM study, which directly targets the concepts of progression and years to graduation in view of many factors; guidelines for external funding sources, transcript review by potential employers, emotional weariness from excessively repeating courses, factual cost of education with repeated coursework (compared to earning a degree with taking each course only once), and clearly defined goals for obtaining the degree. The students in the ACM study, who did well on the ACM quiz, demonstrated progression to a greater degree. The ACM quiz posed questions, based on certain scenarios targeting progression
concepts, and students were required to think critically about the outcomes, selecting the best decision based on forecasting. Questions on the quiz increasingly required greater forecasting ability to select the correct answer. Students who could correctly process the information on the quiz demonstrated that the foundational cognitions were developed to the degree that they could apply the same cognitions to their own academic decisions.

**Objective 4 Implications:** One of the most frequent activities of academic advising is course selection, which quite often requires an advisor’s approval. Typically, this activity directly precedes registration for the upcoming semester. A face-to-face format offers prime opportunity for rich discussion about the student’s goals, interests, abilities, and other pertinent information. For beginning freshmen, who haven’t had the opportunity to acclimate to the university environment, the course selection process needs more time and attention. An intrusive system, with a student-centered philosophy and advisors who incorporate developmental advising techniques, would serve as a catch-net for different populations (male students, minority students, first-generation college students, etc.) by anticipating and addressing key issues before they become problematic.

Based on the outcomes for this objective, it would make good sense to require advisor contact for students who wanted to register (the first semester of college) for fewer than 12 or more than 16 credit hours. Permission should not be the focus, but rather discussion of plans, aspirations, involvement requiring time and energy other than college course work, and assessment of the whether or not the student exhibits realistic-based expectations. Instead of simply course selection and approval, this type of procedure would reflect a mentoring program. Gardner and Hansen (1993) stressed that the initial meeting between the advisor and advisee is the most critical opportunity for developing important advisor/advisee relationships, an all
important element for student success. A structured tool, such as the ACM instrument, would guide discussions, systematically and comprehensively, leaving less of the student’s progress during the first semester of enrollment to chance.

**Objective 5 Findings:** Logistic regression results explain the odds of the desired outcome occurring under certain conditions. There were five factors significantly correlated with the dichotomous variable of whether or not the student was likely to persist in the university for the next semester; ACM study participation, ACM quiz scores, CCTDI® post-test scores, ACT composite, and gender. The factors were entered as independent variables into a binary logistic regression model, using Forward Likelihood Ratio (an exploratory function), to determine the best model fit for predicting success or failure in the outcome of interest (persistence) and to account for the percent of variance in persistence attributed to the predictors. ACM study participation was the only predictor retained in the model, predicting success (persistence) at 100% and failure (non-persistence) at 0%, making overall model accuracy at 88%. The proportion of variance attributed to ACM participation was low (approximately 3% to 6%), but significant (p <.001). The model detected 15 misclassified cases, who were predicted to persist, but did not (standardized residuals >3.0). Casewise diagnostic tests did not warrant removal, as measurement error was not an issue. The basis for misclassification was for students who were in the treatment group sections of the freshman seminar class, but who were not enrolled in the spring 2007 semester.

Logistic regression predicts the likelihood of success or failure, and yields a value, Exp(B) (similar to beta in linear regression), that indicates how much greater the odds will be for success under certain conditions. The Exp(B) value for the model showed that for students who participated in the ACM activities, the odds of persisting were 3.021 times greater than the odds
of persisting for students who did not participate in academic advising through the structured ACM system. The research outcomes made a strong statement about the value of the study. With the wide array of both positive and negative experiences for students during the first year of college, an advising instrument that can show impact on the students’ continuation in the university warrants merit.

**Objective 5 Conclusions:** Persisting in the university meant that the students felt confident they could repeat the process of studying, note taking, test taking, reading, going to class, etc., for reaching their expressed goals. The ACM study was designed to give students the “big picture” of what the process of earning a degree would entail. The concepts of postponement, academic weariness, required cognitive and affective stances for success, and rational decision-making processes necessary for making the best of each semester were addressed, while discussions centered on outcomes and benefits from the outcomes of success. Participation in the study prepared students for anticipating obstacles and proactively planning strategies for overcoming those obstacles. Chickering and Reisser (1993) stated that attention must be given to several developmental tasks for making adequate career and academic choices, and with resolution of the tasks, persistence will increase. Helping students develop emotional, social, and intellectual competence, assess their personal interests and abilities, and develop a sense of self in a career-related context all predict successful completion of college work. The ACM study targeted all of those developmental tasks, and the results of the research concurred that participation in the study helped students to adequately resolve those tasks for continuance toward a degree.

**Objective 5 Implications:** Students who persist have a sense of future; a sense of purpose. For entering college freshman who have not developed clear career and academic goals, early
help can make the difference. Giving help to entering first-time college freshmen requires that a set of assumptions, whether true or not for each student, must be held as measuring criteria. It must be assumed that students have defined career and academic goals, that students want to earn a degree, that students are willing to make the necessary sacrifices, that students have adequate intellectual capabilities, etc. With the set of assumptions, a checklist for guiding discussions can be placed in the hands of every academic advisor who works with first-time freshmen for determining if the assumptions are faulty and further exploration is warranted.

According to past research, problems with attrition (early departure or non-continuation for the following semester) are greatest during the freshman year of college (approximately 40%) with 50% of attrition occurring during the early weeks of the first semester (Glennen, 1995). Those percentages present the necessity for early interventions that target common issues through comprehensive and intrusive initiatives, and with discussions aimed at finding the unique dynamics within each student. With an academic advising program in place, and an advising tool such as the ACM instrument, success in the university will not be left to chance, but will be guided through strategic planning and forecasting.

**Recommendations**

Informational needs change for students from the freshman to senior year of college, and avenues for delivering the information must adapt and respond in an appropriate, timely manner to meet students’ needs. Beginning students quite often have limited information processing skills, especially when personal dynamics are major considerations and require intrusive techniques for problem avoidance. Academic advisors, and others who are involved in retention programs, should have defined and effective intervention strategies in place, such as tracking mechanisms for checking student progress in coursework, dependable contact information for
connecting with students when progress is questionable, follow-up procedures and salient “homework” assignments for academic interventions. Advisors should model for students the independent and interdependent nature of successful interactions in the college environment and in future economic settings.

Proactivity is paramount for maximizing success. Incorporating a developmental model of advising means that the advisor knows when to be prescriptive; sometimes it’s best to simply give information and other times skillful questioning will yield the greatest results. Skillful questioning is critical for discovering the student’s personal, academic, and financial dynamics that may become problematic for student early in the semester. Early course selection discussions should focus on the student’s personal interests and abilities rather than just the prescribed curriculum. When selections are made based on student dynamics for the first semester, academic success is optimized, and logically, engagement and commitment to the overall plan is more likely. According to Tinto (2002), students who are actively engaged in the university and committed to earning a college degree are less likely to experience academic negativity. With confidence in a plan and a positive outlook, students will be more likely to proceed at the prescribed rate and according to the curriculum as outlined in the college catalog.

It is a recommendation that the ACM instrument be further developed as an online tool that is continuously available for student use in planning and forecasting. Refining the instrument for streamlining the visual presentation and broadening the scope of persistence factors may increase the overall value of the model. The ACM instrument consistently showed involvement with academic success in this study, but its prediction ability may increase by including the dimension of psychosocial concepts (i.e., need for immediate gratification, ability to postpone non-academic activities, endurance of activities that are perceived as boring or
difficult, and proclivity for seeking help) to the persistence factors questionnaire and combining some of the personal, academic, and financial factors. Creating a broader “net” for addressing persistence issues will enhance the instruments merit for proactively addressing problematic issues and teaching the critical thinking skills necessary for making rational decisions. It is further recommended that the persistence factors questionnaire, with the additional dimension, be collected prior to meetings for course selection and approval. With an on-line ACM instrument in place, the questionnaire could be an added feature, with automated information processing beginning at that point. Advisors and advisees should have access to that information prior to the first meeting to prepare for rich and meaningful dialogue and interchange.

Time allotment for advising and caseloads for advisors presents a major concern. With an on-line instrument that offers automated information processing, and with advisor training, the time spent should be considered well worth the effort in terms of retention dollars and program funding. Glennen, Farren and Vowell (1996) summarized the value of quality first-year advising programs by stating that upon fiscal review, such programs stabilize fiscal profiles by increasing retention and graduation rates. Universities which understand the link between quality academic advising programs and student success have allocated more resources (staff and equipment) to program development.

The ACM study should be repeated, comparing group outcomes to use of the instrument in one-on-one sessions, over a full semester. Follow-up and longitudinal data should be collected, as quite often, the natural maturation process allows for greater assimilation and accommodation of complex information. A further look at the value of the ACM instrument would involve tracking student grade point averages, progression and persistence from the freshman to sophomore year in comparison to students who were never involved in the ACM
study. It is implied that teaching the use of the instrument occurs the first semester but that continued use is expected over subsequent semesters.

Qualitative interviews would add richness and depth to the study that could not be achieved otherwise. Regardless of the number of items/questions asked on the persistence factors questionnaire or how many days or weeks the study lasts, or what type of quantitative statistical view is selected, the personal experience of each student may be unique and beyond those anticipated by the researcher. It is recommended that qualitative data be collected during the process of using the ACM instrument, through interviewing, journaling, or focus group methods. The actions involved with collecting qualitative data will, in and of themselves, communicate interest and support to first-semester freshmen.

In conclusion, it should be stressed that quality academic advising is intentional and not accidental. Cuseo (2003) stated good advising is based on a good plan and should have good outcomes. Asking the questions “what will it look like?” and “what will be expected?” and “how will we know?” is a start. Defining the terms, the process, the learning outcomes, the strategies and follow-up procedures logically must precede any actions. With a sound structured system in place, and expectations and outcomes clearly defined, the likelihood of student success increases. The ACM instrument is one such system, offering much value to the profession of academic advising and to the outcomes of student success.
REFERENCES


[www.cbsnews.com/stories/2001/08/20]


APPENDIX A

PURPOSE AND IMPORTANCE OF THE STUDY

The purpose of the study is to measure the effectiveness of an academic advising system in addressing the factors that lead to student attrition (dropping out of college) and persistence (continuing in college).

Student continuation in college and eventual graduation is important to the student, the family structure, society, and the academic institution. Educated members of a community tend to have more family stability, and they have a direct impact on the economic growth of an area. Today, getting a college education is more important than ever for landing high paying jobs with good working conditions. Six of every 10 jobs now require at least some college training. In the near future, even more jobs will require advanced education levels. The average college graduate today earns more than twice as much as a person with only a high school diploma. Over a lifetime, this amounts to over one million dollars.

Nationwide, only about half of all students who start college will graduate and approximately 26-30% drop out their first year, and most drop out in the first few weeks of the semester. Approximately 26% of freshmen graduate within six years of starting college. It is important to the University and you that those numbers be increased.

This study was designed to help you and your fellow students persist and become successful college students.

Your participation is important. Please give your consent to participate by signing the student consent form.

Thank you,
Dorothy Burton Nelson
Student Information and Consent Form

I, ____________________, have been asked to participate in this study. Dorothy Burton Nelson, who is conducting this research to study academic persistence factors and appropriate ways for addressing those factors through academic advising, to fulfill the requirements for a doctoral dissertation at Louisiana State University, has explained the study to me.

I understand that the purpose of the study is to identify factors and strategies for maximizing academic success.

This study will be conducted during my Freshman Seminar 101 course. I will be asked to respond to a pre and post-test, each taking about 15 minutes, to respond a 5 minute questionnaire, and develop an academic concept map, which will take about five class periods to complete.

I understand that this study is expected to be of direct benefit to me, and the knowledge gained may be of benefit to others. I understand the benefits for me include learning how to proactively plan a degree program, and developing greater awareness of the long-term effects of academic decisions. The purpose of the study is to increase my persistence and progression in my chosen curriculum.

For more information about this research, I can contact Ms. Burton Nelson at dburton@selu.edu, or 549-3981, or my Freshman Seminar instructor.

I understand that any information obtained as a result of my participation in this research will be kept confidential. In any publications that result from this research, neither my name nor any information from which I might be identified will be published. All reports and publications will contain aggregate data.

Participation in this study is voluntary. I understand that I may withdraw at any time. Refusal to participate or withdrawal will involve no penalty or loss of benefits for me. I have been given the opportunity to ask questions about the research, and I have received answers concerning areas I did not understand.

I willingly consent to participate in this study.

________________________________________  __________________
Signature of Participant                    Date

LSU Internal Review Board (contact information)
Robert C. Mathews, Chairman, at 203 B-1 David Boyd Hall, Phone - 225-578-8692.
Parent Information and Consent Form

I, __________________, have been asked to allow my son/daughter, __________________, to participate in this study. Dorothy Burton Nelson, who is conducting this research to study academic persistence factors and appropriate ways for addressing those factors through academic advising, to fulfill the requirements for a doctoral dissertation at Louisiana State University, has explained the study to me.

I understand the purpose of the study is to identify factors and strategies for maximizing academic success for freshmen students.

This study will be conducted during your son/daughter’s Freshman Seminar 101 course. Your son/daughter will be asked to complete a 5 minute questionnaire and will develop an academic concept map, which will take about three class periods to complete.

I understand that this study is expected to be of direct benefit to my son/daughter, and the knowledge gained may be of benefit to others. I understand the benefits for my son/daughter include learning how to proactively plan a degree program, and developing greater awareness of the long-term effects of academic decisions. The purpose of the study is to increase my son’s/daughter’s persistence and progression in his/her chosen curriculum.

For more information about this research, I can contact Dorothy Burton Nelson at (985)540-3981, email her at dburton@selu.edu, or contact the Freshman Seminar instructor.

I understand that any information obtained as a result of my child’s participation in this research will be kept confidential. In any publications that result from this research, neither my son’s/daughter’s name nor any information from which he/she might be identified will be published without my consent.

Participation in this study is voluntary. I understand that I may withdraw my son/daughter from this study at any time. Refusal to participate or withdrawal will involve no penalty or loss of benefits for me or my son/daughter. I have been given the opportunity to ask question about the research, and I have received answers concerning areas I did not understand.

I willingly consent to my son’s/daughter’s participation in this study.

______________________________  ____________________
Signature of Parent or Guardian                  Date

______________________________  ____________________
Signature of Investigator or Representative      Date

LSU Internal Review Board (contact information)
Robert C. Mathews, Chairman, at 203 B-1 David Boyd Hall, Phone - 225-578-8692.
APPENDIX C

ACM PAGE 1 PREPARATION DOCUMENTS

Student Persistence Factors Questionnaire

<table>
<thead>
<tr>
<th>Name</th>
<th>ID</th>
<th>Age</th>
<th>Gender</th>
<th>Ethnicity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>M/F</td>
<td>African American</td>
</tr>
</tbody>
</table>

1. High School grade point average___________________________

2. ACT: Composite____ Math____ English____ Science____ Reading____

3. On average, how many hours per day did you study in High School?________________________

4. What was your hardest high school subject?________________________

5. What was your easiest high school subject?________________________

6. What was your most interesting high school subject?________________________

7. In what high school organizations were you active?________________________

8. What is your current college Major?________________________

9. I plan to graduate in: 3 yrs____ 4 yrs____ 5 yrs____ 6 yrs____ More than 6____

10. Will your career plans include graduate or professional school?________________________

11. What grade point average will you have to maintain for your plans?________________________

12. In how many credit hours have you enrolled this semester?________________________

13. Have you found your curriculum in the college catalog?________________________

14. Have you read any of the course descriptions?________________________

15. Rate your study skills: Excellent_____ Good_____ Need Improvement____

16. How many hours will you work per week?________________________

17. Are your work hours flexible?________________________

18. How long have you worked at this job?________________________

19. Residence: Family home____ On-campus housing____ Off-campus housing____

20. How many roommates will you have?________________________

21. How long is your commute to campus (in minutes)?________________________

22. Primary source of college funding: TOPS____ Loans____ Grants____ Parents____ Self____

23. Are you responsible for monthly bills? No____ Yes____

24. Are you worried about paying those bills? No____ Yes____

25. College graduation: Mother only____ Father only____ Both____ Neither____

26. Approximately how many hours a week do you read?________________________

27. Approximately how many hours a day do you watch television?________________________

28. How many nights a week do you go out to socialize with friends?________________________
**Student Persistence Factors and ACM Worksheet Instructions – Faculty Script**

*(Students should have a pencil, their persistence factors questionnaire, an ACM worksheet, and ACM Page 1)*

As we go through each of the items on your questionnaire, reflect on what it means to your particular situation and place it as either a possible positive or negative factor on the Academic Concept Map Worksheet in the appropriate area (academic, financial, personal – some can fit in more than one place). The Academic Concept Map will help you the most if you are honest with yourself in how you do this.

1. High school grade point average (academic factor). The high school grade point average is an academic factor which may be an indication of a college student’s abilities (but not always). A high grade point average in high school (>3.0) may indicate that the student either was smart enough to get good grades without studying a lot or did study a lot or both. To achieve a high college grade point average requires both “smarts” and a lot of hard work. Even valedictorians sometimes flunk out of college. A low high school grade point average may be a cause of concern. If a student had less than a 3.0 in high school they need to look at why it was not higher so they can take steps to succeed in college. Also, be aware that a 3.5 grade point average from one high school may not be as strong as a 3.5 from another. On your worksheet, place #1 (H.S. grade point average.) under academics as either a positive or negative factor.

2. ACT Composite and sub-scores (academic factor). Many studies have shown that one of the best predictors of college success is the ACT (or SAT) score, especially the English sub-score. This is why most colleges with admission standards use these scores as the primary standard for admission. Students with a high ACT (>24) are more likely to graduate than those with less than a 20. A lower ACT does not mean that the student will not graduate but they may have to work harder to do so. Place #2 (ACT scores) under academics as a possible positive or negative factor.

3. On average, how many hours per day did you study in high school (academic and/or personal)? If you put less than 2 hours you were probably one of those students who got by on your intelligence without a lot of studying. This can be a risk factor because you may not have learned how to really study. The first semester in college is quite a shock for students who find out that what worked in high school will not work in college. A typical guide for study time is that you should study about 2 hours a week for each hour of class. So if you are taking 15 hours you should be spending about 30 hours a week studying. That works out to 5 hours a day for six days a week. Place #3 (study hours), as a positive or negative factor under academics and/or personal.

4. What was your hardest high school subject? (academic factor) If math was hard in high school, it most likely will be hard in college, too, and you may need extra help (like tutoring). Place #4 (your hardest subject) as a negative factor under academics unless nothing was hard for you in which case you can place #4 as a positive factor.

5. What was you easiest high school subject? (academic; same reasoning as above). It is generally recommended that you mix hard and easy subjects in your semester load. Place #5 (your easy subject) as a positive factor under academics, unless you did not identify an easy subject.

6. What was your most interesting high school subject? (academic) This may be a good indication of a possible major or minor in college for you. For instance, if you are a pre-med student but you really liked music in high school you may want to consider taking enough music to be able to minor in it. Place #6
(your most interesting subject) as a positive factor under academics unless you didn’t list one, in which case it would be a negative factor.

7. In what high school organizations were you active? (academic and/or personal) Students who were active in high school outside of the classroom are more likely also to be involved in organizations and activities on the college campus. Studies have shown that the more connected and involved a student is with their college and campus life, the more likely they are to continue through to graduation. However, too much involvement in extracurricular activities could be a negative factor, when it interferes with studying. Put #7 (involvement) as a positive or negative under academic and/or personal.

8. What is your current college Major? (academic) Declaring a major in the freshman year is not critical. Many college students change their major at least once anyway. The important thing is finding the right major for you. If you are really sure about what you want to major in then it is good to get started on it; but being undeclared the first year and exploring different majors is not necessarily a bad thing if you’re active in finding the information you need to make the decision. Decide whether having declared a major or not was a good decision. Put #8 “major” under positive or negative.

9. I plan to graduate in 3, 4, 5, 6 or more than 6 years (academic and/or financial). We tend to think of a college degree as a four year degree but for many reasons the typical student at Southeastern takes about 6 years to graduate. The university would like to see more students graduate in 4 or 5 years. Also, some financial aid will only pay for a certain number of semesters, and some students run out of financial aid before they graduate (so you foot the bill). Put #9 “years to graduate” as a positive or negative factor under the academic and/or financial column on the worksheet.

10. Do your career plans include graduate or professional school? (academic and/or personal) If you put yes – great! Just be aware that these schools are very competitive and if you want to have a good chance of getting in you must be willing to work very hard as an undergraduate. The average grade point average for most professional school applicants who get in is now about a 3.5 which means you need to make all A’s and B’s. Are you ready for that? Place #10 “career plans” under academic and/or personal factors as a + or -.

11. What grade point average will you have to maintain for your plans? (academic) To graduate in most majors, all you need is a 2.0 cumulative grade point average (or degree grade point average). Some majors require a 2.5 or higher. But as discussed earlier, if your plans include graduate or professional school you will need a much higher grade point average. Employers may look at the grade point average for determining how serious you are in your efforts. Under academic put #11 (grade point average needed) as positive (if you feel you will be able to easily achieve it) or negative (if you might have to struggle to make it).

12. In how many credit hours have you enrolled this semester (academic and/or personal)? Full time is 12 or more hours and a typical load is between 15 and 18 hours in order to graduate in four years. Some students can handle 19 hours a semester with no problem while others struggle with 12. In addition to the hours in class you need to factor in your study hours. If you are working full time it might be hard to find time to study as much as you need to. Is your course load a positive or negative factor (can be academic and/or personal).

13. Have you found your curriculum in the college catalog? (academic) This may be indicative of your initiative and need to know – two important characteristics for college success. There is a lot of important information in the catalog that you need to know, including degree plans. If you have read portions of the catalog, place #13 under a positive academic factor, if not, place #13 as a negative factor.
14. Have you read any of the course descriptions? (academic; same logic as above). If you have looked up course descriptions, place #14 as a positive academic factor (negative if you haven’t).

15. Rate your study skills (academic and/or personal). If you could honestly answer “excellent”, that’s great! Just remember that what worked in high school may not always work in college. If you chose “need improvement” that means you are already aware of this. Good start! Place #15 under the academic and/or personal positive or negative lists.

16. How many hours do you work per week? (academic, personal and/or financial) This goes along with your course load because there has to be time for everything (including studying). Working full time and going to school full time will compete for your time. If you are working full time you need to take a hard look at why you need to work so many hours. Do you have a family to support or are you working just to have a nicer car? Are the things or people you are working for higher priorities than earning a college degree? Place #16 under the categories that you feel most affects you.

17. Are your work hours flexible? (academic/personal/financial) If your work hours are not flexible this could cause problems at final exam time because finals are not always on the same days or at the same times as the class. Study groups form at various times, and that may be just what you need to get the grade you want. List #17 where you think it belongs in your situation.

18. How long have you worked at this job? (personal and/or financial) If you have worked at a job for a couple of years, then it is more likely that you can take time off if needed but if it is a new job that might be harder. It could also mean that you’ll have to focus more on work and less on courses. Place #18 in the appropriate column.

19. Where will you live? In a dorm? In an apartment? With your parents? (personal and/or financial) Your living arrangement can affect your ability to find study time, concentrate without interruptions, get sleep when you need it -- all for doing well in college. It can also have a major impact on your finances. Rate #19 under personal and/or financial factors.

20. How many roommates will you have? Living alone can be hard for some people but great for others. Some students get lonely or homesick their first time away from home. Having roommates can help with homesickness and can reduce living costs; but, having bad roommates or too many roommates can cause major problems. Rate your situation (#20) under personal and/or financial factors.

21. How long is your commute? The distance and time of commuting can be important. A long commute can often take away time that could be used for studying and also commuters often face being late to class because of traffic and parking problems. There is also the expense of gas to consider! Rate your situation (#21) under personal or financial factors.

22. Do you have a grant? Loan? Scholarship? What is the primary source for paying your college costs? Financial aid can help a lot. If you are lucky enough to have these funding sources, great. These types of financial aid have conditions, like grade point averages and hours completed – which may add stress. Loans can help but just remember they eventually have to be paid back. Will your parents or others help you financially? Having someone to provide at least some of the support can help a college student a lot. Parents want a return on their investment and will expect you to make the grades. It is hard today to support yourself completely while attending college. Rate #22 (financial and/or personal).

23. Are you responsible for your monthly bills? If you are, that may be a good learning experience for life but can also be distressing when there are more bills than money! Rate and place #23 (financial)
24. Are you worried about paying those bills? Financial problems are one of the main reasons students give for dropping out of college. Rate #24 (financial worries) as a positive or negative.

25. Did your parents graduate from college? Studies have shown that first generation college students are more likely to place financial responsibilities above academic responsibilities. Getting a college degree may not be the top priority. Also parents who are college graduates most likely will have more income and be better able to help their children in college. #25 (personal and/or financial)

26. How many hours a week do you read? The importance of reading cannot be overstated. Many studies have shown that reading ability is one of the best predictors of college success. This means reading all kinds of material – newspapers, magazines, journals, books and not just textbooks. One study showed that the students who did the best on the MCAT (needed to get into Medical School) were the ones who read the most. #26 (academic and/or personal)

27. On average, how many hours a day do you watch television? TV can be a killer if you overdo it. Not only does it take away from study and reading time but it can be mind-numbing. Rate and place #27 (personal).

28. How many nights a week do you go out to socialize with friends? An answer of none might be of concern because everyone needs to do some socializing, but going out several nights a week limits study time, and partying too much is a very attractive trap! Rate and place #28 (personal).
ACM PAGE 1 PREPARATION DOCUMENTS

Academic Concept Mapping Worksheet

Name_____________________________ ID_____________________________

List your four academic goals from the Persistence Factors Questionnaire:
1. From item #8: ________________________________
2. From item #9: ________________________________
3. From item #10: ________________________________
4. From item #11: ________________________________

As your instructor reads the explanation for each persistence factor on the student questionnaire, think about your own answers, and then place the **question/item number** in the appropriate space below. Be sure to consider your four academic goals.

For instance, if you determine that your ACT composite and sub-scores are positive academic factors when considering your goals, you would place a “2” under “Academic Factors”, “Positive”. If any of the sub-scores are negative factors, place the “2” under both headings. You’ll have a chance to explain your answers on the ACM page 1.

<table>
<thead>
<tr>
<th>Academic Factors</th>
<th>Personal Factors</th>
<th>Financial Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
</tr>
<tr>
<td></td>
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</tr>
</tbody>
</table>
APPENDIX D

ACM PAGE 1

Name ___________________________   ID ___________________________

Your academic goals are affected by your academic, personal, and financial factors. The affects may be positive or negative. Being aware of the potential risk factors will help you to plan now to avoid problems.

1. Review your ACM worksheet.
2. Identify what you consider to be your strongest “success” factors.
3. Identify what you consider to be your strongest “risk” factors.
4. Place the **risk** factors in the appropriate box (don’t place the numbers, but write out the factor so that it will be clearly understood – for example, a negative under financial factor #16 could be written as “35 work hours”).
5. Explain, in the box below, what you can **realistically** do to minimize the risks to your goals.

```
Academic Risks
1.
2.
3.

Personal Risks
1.
2.
3.

Financial Risks
1.
2.
3.
```

```
Academic Goals:
GPA ________  Strategies to minimize the risks to academic goals.

Major ________

Yrs to Grad____

Prof. Sch.____  ______________________________________________________
       ______________________________________________________
       ______________________________________________________
```

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Grade Point Average Calculations

**Semester grade point average:** This number, which ranges from 0.0 to 4.0, is derived from calculating grades and quality points for the course load taken during a given semester. Quality points are calculated by multiplying the number of credit hours for a course by the value of the grade earned in that course (e.g., the value of an “A” is 4 points, a “B” is 3, a “C” is 2, and a “D” is 1 point). For a grade of “A” earned in a three hour course, you would earn 12 quality points.

**Cumulative grade point average:** This number, which has the same range as a semester average, is calculated by the credit hours and grades earned for every course you’ve taken. If you repeat a course, both grades will be calculated into the cumulative G.P.A. The same formula is used for calculating all grade point averages.

**Degree grade point average:** Similar to cumulative, but only the courses listed in your degree plan. If you repeat one of your required courses, only the highest grade will be calculated. Same formula used.

**GPA formula:**
1. Number of credit hours × the point value of the grade = Quality points
2. Total number of quality points ÷ total number of credit hours = Grade Point Average

**Example:**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
<th>Grade</th>
<th>Quality Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>College Algebra</td>
<td>3</td>
<td>B</td>
<td>9</td>
</tr>
<tr>
<td>English Comp.</td>
<td>3</td>
<td>A</td>
<td>12</td>
</tr>
<tr>
<td>History</td>
<td>3</td>
<td>C</td>
<td>6</td>
</tr>
<tr>
<td>Kinesiology Lab</td>
<td>1</td>
<td>B</td>
<td>3</td>
</tr>
<tr>
<td>Health Studies</td>
<td>2</td>
<td>A</td>
<td>8</td>
</tr>
<tr>
<td>Communication</td>
<td>3</td>
<td>B</td>
<td>9</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>15</strong></td>
<td></td>
<td><strong>56</strong></td>
</tr>
</tbody>
</table>

56 QP ÷ 15 CH = 3.733 G.P.A.

Your turn. Enter your courses, your predicted grades and calculate you semester grade point average. Will you meet your goal?

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
<th>Grade</th>
<th>Quality Points</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Quality Points ( ) ÷ Graded Credit Hours ( ) = G.P.A. ( )
Academic Concept Mapping - Interests and Abilities Checklists

Check your strongest skills/abilities and interests from the lists below, as compared to your peers:

<table>
<thead>
<tr>
<th>✓</th>
<th>Description of Skills/Abilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td>Help people through discussion, advising, counseling</td>
</tr>
<tr>
<td>✓</td>
<td>Help people through providing physical safety</td>
</tr>
<tr>
<td>✓</td>
<td>Planning as part of a team</td>
</tr>
<tr>
<td>✓</td>
<td>Taking charge of a team; leadership; persuasion</td>
</tr>
<tr>
<td>✓</td>
<td>Training and directing others in activities</td>
</tr>
<tr>
<td>✓</td>
<td>Working with hands; precision work; handling equipment</td>
</tr>
<tr>
<td>✓</td>
<td>Designing systems; drawing or using computer assisted design</td>
</tr>
<tr>
<td>✓</td>
<td>Researching, reading and reporting about certain topics</td>
</tr>
<tr>
<td>✓</td>
<td>Speaking in front of small and large groups; giving presentations</td>
</tr>
<tr>
<td>✓</td>
<td>Observing, analyzing, and developing ideas and information</td>
</tr>
<tr>
<td>✓</td>
<td>Calculating, computing, using math formulas and concepts</td>
</tr>
<tr>
<td>✓</td>
<td>Recording information for budgets</td>
</tr>
<tr>
<td>✓</td>
<td>Performing or creating as part of a talent (music, art, dance, acting)</td>
</tr>
<tr>
<td>✓</td>
<td>Thinking logically and quickly</td>
</tr>
<tr>
<td>✓</td>
<td>Visualizing space and space management</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>✓</th>
<th>Description of Interest Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td>Helping people</td>
</tr>
<tr>
<td>✓</td>
<td>Drama, theater, acting</td>
</tr>
<tr>
<td>✓</td>
<td>Public speaking</td>
</tr>
<tr>
<td>✓</td>
<td>Religion or theological studies</td>
</tr>
<tr>
<td>✓</td>
<td>Foreign languages</td>
</tr>
<tr>
<td>✓</td>
<td>Writing, journalism</td>
</tr>
<tr>
<td>✓</td>
<td>Working with numbers and computers</td>
</tr>
<tr>
<td>✓</td>
<td>History, anthropology, ancient civilizations, wars</td>
</tr>
<tr>
<td>✓</td>
<td>Health and medicine</td>
</tr>
<tr>
<td>✓</td>
<td>People and their behaviors, alone or in groups</td>
</tr>
<tr>
<td>✓</td>
<td>Sports and athletic events</td>
</tr>
<tr>
<td>✓</td>
<td>Fashion and personal appearance</td>
</tr>
<tr>
<td>✓</td>
<td>Relationships in families and child development</td>
</tr>
<tr>
<td>✓</td>
<td>Mechanical devices and instrumentation</td>
</tr>
<tr>
<td>✓</td>
<td>Places, regions, and cultures of the world</td>
</tr>
</tbody>
</table>
APPENDIX F

ACM PAGE 2

Name_________________________ ID______________________

Select the top three skills/abilities and interests from the checklists and enter them in the boxes below.

<table>
<thead>
<tr>
<th>Top Three Skills/Abilities</th>
<th>Top Three Interest Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

Enter your current course schedule. If the courses you're taking will incorporate your abilities, mark that course with a red colored pencil. If the course you're taking will incorporate your interests, mark that course with a blue colored pencil.

Notice the courses with **both colors** marked. These should be the courses you most enjoy and may find “easy”. Note the courses with **no marks**. These courses may be those you’ll find more difficult.

Keeping that in mind, **predict the grades** you think you can earn in those classes this semester.

You’ll have a “checkpoint” during the semester to confirm or adjust your predicted grades. How accurate can you be in your initial prediction?

<table>
<thead>
<tr>
<th>Fall 2006 - Course Prefix and Number</th>
<th>Predicted Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Based on your interests, your abilities and your predicted grades, list courses for the spring 2007 semester. Try to project a little farther and list courses for the fall 2007 semester.

<table>
<thead>
<tr>
<th>Spring 2007 Course Prefix and Number</th>
<th>Credit Hrs.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fall 2007 Course Prefix and Number</th>
<th>Credit Hrs.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>
APPENDIX G

ACM PAGE 3 PREPARATION DOCUMENT

Distribute an ACM Page 3 to each student, by college major.

1. The purpose of this map is for you to understand your current academic profile, your academic demands, and different decisions you’ll face each semester and determine how they will affect your academic goals. **Your goals should include a “target” grade point average, years-to-graduation, and your college major (and possibly your plans to enter professional school).**

2. Fill in your information in the top sections, other than the one section titled “out-of-curriculum courses.”

3. Be sure to list your goal of how long you plan to be in college for earning a bachelor’s degree. Four years should be written as 8 semesters. You can include summer sessions as needed, but for now just write in the number of fall and spring semesters you plan to attend.

4. Notice the number of hours required for degree completion. Be sure to keep that in mind as you begin to fill in this academic map.

5. Divide the total number of hours required for the degree plan by the number of semesters you plan to be in school. What is the minimum number of hours you’ll need to take each semester?

6. For each decision you make in an immediate semester, you may drastically impact one of your goals. You’ll be able to see how that will happen as we begin to fill out the map.

7. Fill in the semesters across the top of the map. Don’t include summer sessions, unless you are very sure that you will have to go to summer school.

8. Refer to ACM Page 2; you have made a list of the courses you are currently taking, and projected courses for the next two semesters.

9. Place check marks beside the courses you are currently taking (leave room to enter your predicted grade).

10. If you are taking a course that is not listed along the side, then enter that course prefix and number in the upper right hand section, titled “out-of-curriculum courses”.

11. Enter your predicted grades beside each of the check marks.

12. Place check marks beside each of the courses you plan to take for the next two semesters, placing them under the correct semester heading.

13. Calculate your semester grade point average for the first semester.

   a. Does it meet your target goal?
   b. Did you take enough hours this semester?
   c. If not, when will you make up the hours?

14. Your cumulative G.P.A. will be the same as your semester G.P.A. for the first semester.

15. Your degree G.P.A. may be different. Your degree G.P.A. is calculated by the credit hours and quality points for all but the out-of-curriculum courses. If you repeat a course, then only the highest grade of that course is calculated. **BUT EVERYTHING IS CALCULATED IN THE CUMULATIVE. THERE IS NO GRADE REPLACEMENT.**

16. Using the registration guide, mark all courses that are “Fall Only” courses in red.

17. Mark all courses that are “Spring Only” courses in blue.

18. Pick your two hardest or least interesting courses, that you are enrolled in this semester, and change those grades to a D or an F (don’t worry, you can change them back – that’s why you’re using pencil). Now recalculate your semester grade point average.

19. Look at your second semester. What changes will you have to make to that semester? When you make those changes, how will your third semester be impacted?
20. Don’t erase the D and F in the immediate semester. Calculate your semester grade point average for the second semester (you’ll be repeating two classes). When you calculate your degree G.P.A., you have some work to do. Here’s the rule:
   a. Calculate only the credit hours and quality points for courses listed in your curriculum
   b. Calculate only the credit hours and quality points for the highest grade with a course is repeated.

21. You’ll find out that with every repeated course, your cumulative G.P.A. and your degree G.P.A. may move further apart – with a lower cumulative and a higher degree G.P.A.

22. If you take courses that are out of your curriculum, you won’t progress toward graduation, and if you don’t make a high grade, your cumulative will fall, but your degree G.P.A. will not be affected.

Decisions, decisions, decisions.

What happens when you withdraw from a class? How does a withdrawal calculate into a G.P.A.?

Is it better to repeat a past course in your curriculum, or take a new course in your curriculum for improving your degree G.P.A. the quickest? (remember your G.P.A. goal!)

If you withdraw from a “Fall Only” course, how many semesters will you possibly add to your degree plan?

If you withdraw from a “Fall Only” course that is a pre-requisite for 3 other courses that must be taken in sequential order, how many semesters will be added to your degree plan?

What happens if you complete all of your general education courses, but don’t have the G.P.A. to be formally admitted into your degree program? What will you do? Will you take electives to try and pull up your G.P.A.? Will you go back and repeat courses with a grade of “C” to try and get an “A”?

To make sure you don’t get into that kind of a situation, be strategic. Plan your degree map wisely – balance your schedule with “easy” and “difficult” courses; pay attention to “fall or spring Only” courses; be very aware of courses that have pre-requisites; know what it will take to officially get into your program; know the degree G.P.A. requirements. AND... Last, but certainly not least, how many hours a day will you have to study to make sure that you don’t end up with shattered academic goals. Pace and monitor your study time. Here’s the accepted study formula for successful students:

2 hours of study for every one hour credit (per week)

Calculate Your Daily Time: (be very honest in your estimations; this is to help you)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sleeping</td>
<td>_____</td>
</tr>
<tr>
<td>Eating</td>
<td>_____</td>
</tr>
<tr>
<td>Commuting</td>
<td>_____</td>
</tr>
<tr>
<td>Socializing</td>
<td>_____</td>
</tr>
<tr>
<td>Working</td>
<td>_____</td>
</tr>
<tr>
<td>Watching TV</td>
<td>_____</td>
</tr>
<tr>
<td>Attending Class</td>
<td>_____</td>
</tr>
<tr>
<td>Leisure Activity</td>
<td>_____</td>
</tr>
</tbody>
</table>
Total hours spent daily in these activities

Hours left each day for studying

Where can you make adjustments?

What will motivate you to make those adjustments?

If you make those adjustments, what negative consequences might you face?

What can you do to minimize those potentially negative consequences?
This is an example. ACM Page 3 is a 14x17 worksheet, for comfortable visual management of the page. This example does not include all courses for the major.

The matrix below shows how tracking can occur over several semesters, or for use in forecasting over several semesters.

Role of Faculty/Advisors

- engage students in critical thinking
- ask probing questions
- pose if/then scenarios

Additional materials necessary: College catalog, Registration Guide (shows semester for course offerings)

This example shows a partial list of courses, for a four-year plan, for a Microbiology major.
APPENDIX I

ACM QUIZ

Name_________________________ ID_________________________

Identify the best choice for each of the following scenarios.

1. Assume you are taking 15 hours this semester, and will earn 50 quality points. What will you have for a semester G.P.A.?
   a. 2.57
   b. 3.75
   c. 3.33
   d. 2.00

2. If you take or pass 12 hours a semester, how many semesters will it take you to graduate in a curriculum requiring 121 hours?
   a. 10.08 semesters
   b. 5.92 semesters
   c. 3.37 semesters
   d. 9.15 semesters

CASE OF JOHN

3. John has a 2.407 cumulative G.P.A. with 27 hours attempted and 65 quality points. He needs a 3.2 to apply to professional school, and Junior standing (60 hours). How many credit hours will he need of straight A’s to achieve a G.P.A. of 3.2?
   a. 20
   b. 27
   c. 30
   d. 15

4. If John completes 28 hours over the next two semesters, with a 3.214 for each semester, (90 quality points), will he be eligible to apply to professional school at the end of that time? (refer to the information in question 3)
   a. No, because he will not have enough hours to achieve Junior standing
   b. No, because he will not have a high enough grade point average.
   c. Both a and b
   d. Yes, he will be eligible to apply

5. If John makes a 3.5 every semester, taking 15 hours each semester, how many more semesters will it take for John to reach his goal of a 3.2 cumulative G.P.A.?
   a. 3 semesters
   b. 5 semesters
   c. 6 semesters
   d. 8 semesters

6. To graduate in 4 years, how many hours will John have to complete each semester from his current point (27 hours, with 65 quality points)? He needs 124 hours to graduate.
   a. 16.17 hours
   b. 12.5 hours
   c. 18.9 hours
   d. 10.2
7. John’s degree G.P.A. is 2.864. He has earned 63 quality points, with 22 hours attempted. How many out-of-curriculum credits has John taken?
   a. 2
   b. 4
   c. 5
   d. 7

8. John got a “C” in a required 3-hour History class. Which option would increase his degree G.P.A. the quickest?
   a. retake the History class and get an “A”
   b. take a new 3-hour class in his curriculum and get an “A”
   c. retake an out-of-curriculum class with a grade of “F”, and get an “A”
   d. both a and b

9. John withdrew from a “fall only” course, during his first semester. That course was a pre-requisite course for another fall course, which preceded yet another fall course. All three were to be completed before the last 30 hours of the curriculum. How many semesters did John add by withdrawing from that one class (regardless of his attending summer school)?
   a. 4 semesters
   b. 1 semester
   c. 2 semesters
   d. 3 semesters

10. John has a TOPS scholarship, and is majoring in a strenuous science curriculum. He reported to his advisor that he studies, on average, 20 hours a week, commutes to campus, one hour each way, 5 days a week, and works on-campus, 20 hours a week. He is enrolled in 16 credit hours this semester. He needs 8 hours of sleep each night, and usually spends about 2 hours a day for meals. How many hours, on average, will John have for socializing or leisure activity each day during the normal class week?
    a. Less than one hour each day
    b. 2 hours each day
    c. 4 hours each day
    d. 6 hours each day
APPENDIX J

SOUTHEASTERN IRB DOCUMENT

Institutional Review Board
Box 11851
Phone: 549-2077

DATE: August 8, 2006

TO: Dorothy Burton Nelson

FROM: Dr. Michelle Hall, Chair

RE: IRB Action on Proposed Project

This memo is to inform you of the IRB action with regard to your proposal:

Title: Freshman Questionnaire for Identifying Persistence Factors

This proposal was given: Expedited Review: X

Full Committee Review:

Exempt: 

The result was: Full Approval: X

Denied Approval:

If anything other than Full Approval is recommended, it is your responsibility, as investigator, to submit changes/corrections or plans to accommodate conditions listed below to the Office of Sponsored Research and Contracts prior to initiating the project.

Failure to acquire full approval by IRB before implementation for any project which involves humans or live vertebrate animals means that the PI is not acting in "good faith" with university policy and is not, therefore, guaranteed the protection of the university.

Committee Comments:

IRB Number: 2007-004
APPENDIX K

LOUISIANA STATE UNIVERSITY IRB DOCUMENT

IRB #: E3462
LSU Proposal #: Revised: 06/21/2003

LSU INSTITUTIONAL REVIEW BOARD (IRB) for Louisiana State University
HUMAN RESEARCH SUBJECT PROTECTION Office: 203 B-1 David Boyd Hall
APPLICATION FOR EXEMPTION FROM INSTITUTIONAL OVERSIGHT

Unless they are qualified as meeting the specific criteria for exemption from Institutional Review Board (IRB) oversight, ALL LSU research/projects using living humans as subjects, or samples or data obtained from humans, directly or indirectly, with or without their consent, must be approved or exempted in advance by the LSU IRB. This form helps the PI determine if a project may be exempted, and is used to request an exemption.

Instructions: Complete this form.

Exemption Applicant: If it appears that your study qualifies for exemption send:

(A) Two copies of this completed form,
(B) a brief project description (adequate to evaluate risks to subjects and to explain your responses to Parts A & B),
(C) copies of all instruments to be used. If this proposal is part of a grant proposal include a copy of the proposal and all recruitment material.
(D) the consent form that you will use in the study
to: ONE screening committee member (listed at the end of this form) in the most closely related department/discipline or to IRB office.

If exemption seems likely, submit it. If not, submit regular IRB application. Help is available from Dr. Robert Mathews, 578-8692, irb@lsu.edu or any screening committee member.

Principal Investigator DOROTHY BURTON NELSON Student? O
Ph (985) 782-8733 E-mail dburton4@lsu.edu Dept/Unit HRE

If Student, name supervising professor K.Machtmes Ph. 578-7944
Mailing Address 505 SANS OAKS AVE, HAMMOND, LA Ph. (985) 542-8733
Project Title ACADEMIC CONCEPT MAPPING AS A CRITICAL THINKING TOOL IN ACADEMICAL AD
SOUTHEASTERN DIVISION OF GENERAL STUDIES ADO SELF
Subject pool (e.g. Psychology Students) FRESHMAN STUDENTS ENROLLED IN
Circle any "vulnerable populations" to be used: (children <18; the mentally impaired, pregnant women, the aged, other). Projects with incarcerated persons cannot be exempted.
I certify my responses are accurate and complete. If the project scope or design is later changed I will resubmit for review. I will obtain written approval from the Authorized Representative of all non-LSU institutions in which the study is conducted.

PI Signature DOROTHY BURTON NELSON Date 10/1/06 (no per signatures)

Reviewing Committee Action: Exempted √ Not Exempted Category/Paragraph

Reviewer MATTHEW Signature ROBERT WELT Date 11/8/06

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APPENDIX L

CCTDI® SAMPLE ITEMS

CCTDI

DIRECTIONS:

. Put your name on the answer sheet and on the test booklet.
. Indicate how much you agree or disagree with each numbered statement by filling in the appropriate place on the answer sheet. Read the two examples first.

EXAMPLE A: The best things in life are free.
EXAMPLE B: I'm always doing more than my share of the work.

The answer sheet shows the responses of someone who STRONGLY DISAGREES with EXAMPLE A and LESS STRONGLY AGREES with EXAMPLE B.

Begin with statement number 1 and continue through number 75. Mark your response on the answer sheet in the place with the corresponding number. If you erase a response, be sure the erasure is clean.

. After you have responded to the 75 statements, fill in the information items printed at the bottom of page 5.

1. Considering all the alternatives is a luxury I can't afford.
2. Studying new things all my life would be wonderful.
3. The best argument for an idea is how you feel about it at the moment.
4. My trouble is that I'm easily distracted.
5. It's never easy to decide between competing points of view.
6. It bothers me when people rely on weak arguments to defend good ideas.

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VITA

Dorothy Burton Nelson, a Louisiana resident since 1965, was born in Oklahoma City and raised in Albuquerque, New Mexico. She is currently resides in Hammond, Louisiana. Dorothy and her family moved to the South when her parents accepted positions at Stennis Space Center with the growth of the space program. She completed high school in Slidell, Louisiana. Dorothy attended Southeastern Louisiana University, earning a Bachelor of Arts degree in speech correction and education in 1978, and a Master of Education degree in guidance and counseling in 1991.

After completing her bachelor’s degree, Dorothy worked as a speech therapist with the Regina Coeli Child Development Center in Covington, Louisiana, and worked as an itinerant speech therapist for Capital Home Health in Slidell, Louisiana. Following three years working as a speech therapist, Dorothy accepted a position teaching creating speaking and writing classes to junior and senior high school students in a private school, Covenant Christian Academy, in Carriere, Mississippi. During her tenure at CCA, Dorothy also taught in the lower grades, and provided speech and hearing screenings for first-grade students. She worked at CCA until she entered the master’s program in 1989. In the Master of Education program, Dorothy selected two cognate areas; career development and family studies. Dorothy will complete the requirements for the Doctor of Philosophy degree in human resources education, with a focus on research methodology, which will be conferred by Louisiana State University during the August 2007 commencement ceremony.

Dorothy’s background in career development led her to seek a faculty position at Southeastern upon graduating with a master’s degree, teaching Career Planning 104, a career exploration course for undergraduate students. As a graduate student in the College of Basic
Studies, she taught the career exploration course, especially targeting students who were undecided about a college major. She later developed a curriculum for an upper level career planning course, which targeted students who were entering the job search process. As a faculty member, Dorothy also taught courses other than the career planning courses, by invitation. She taught a marriage and family relations course (FCS 441) for the Department of Family and Consumer Sciences, and taught a university success course for entering freshmen. In addition to serving as a faculty member, one of Dorothy’s primary responsibilities was to advise students in selecting a college major and helping them to plan course schedules that would be conducive for achieving their academic goals. As part of her advising initiatives, Dorothy developed several technological tools to assist in the process. She designed, developed, and managed an online advising system, which has received national recognition by the National Academic Advising Association (NACADA), and is currently being used by Southeastern and several other universities. Dorothy also developed databases for a student sign-in system that collected data about student progress and persistence.

Dorothy currently holds an administrative position at Southeastern Louisiana University, serving as Assistant Director for the newly developed Center for Student Excellence. Her position targets program planning, assessment and evaluation for several units within the Center, in addition to teaching a freshman success course. Prior to the opening of the new center and her new appointment, Dorothy served as the Director of the Career and Academic Planning Center at Southeastern for seven years.

Research techniques and data analysis have always been an interest for Dorothy, and she worked collaboratively with peers and colleagues on a variety of topics. Some of the most recent research projects include Academic Concept Mapping as a strategic advising instrument to
improve academic performance for students in the freshman year of college, self-efficacy of entering Undecided freshmen at Southeastern, effectiveness of tutoring for freshman students enrolled in college algebra at Southeastern, confidence levels in choice of major and persistence in the curriculum for students entering Southeastern as biology majors, at-risk behaviors for undecided majors at Southeastern, academic interventions and outcomes for students readmitted after suspension, satisfaction of students and faculty with on-line academic advising, career mature cognitions among second year students enrolled in a career planning course, career/life dimensions and order of importance, and perception of career preparation for exiting students.

Dorothy has maintained a high level of professional development, regularly presenting papers at local, state, regional and national conferences on the topics listed in the above areas of research. Dorothy has published work with NACADA’s Academic Advising Today (2006), the Clearinghouse of Academic Advising Resources (2006) and the Freshman Year Experience’s Newsletter (1996). In addition to her professional affiliation with NACADA, Dorothy has been involved with the National Career Development Association (NCDA), the American Counseling Association (ACA), and the state branches for those same organizations. She has served as president of the Louisiana Academic Advising Association, is currently the Vice-President for web-based communications, and served on the NACADA Regional Steering Committee. Dorothy has received honors for her work with the national office of NACADA, and was invited to join the faculty in teaching at the NACADA Summer Institute as well as to participate in consulting work with the Bureau of Consultants. She has taught at the Summer Institute for two years and has completed two consulting projects; one with Ivy Community College system in Indianapolis, Indiana, and one with Louisiana State University at Alexandria, Louisiana. Both projects focused on integrating career/life planning and academic advising initiatives.
Dorothy holds professional certification through the National Board for Counselor Certification, and has completed the requirements for earning the credential of Master Career Counselor (MCC) through the National Career Development Association. Her community involvement includes serving as a member of the United Way Allocations Committee since 1995 and actively supporting the arts in the Hammond area, regularly volunteering at events held at the Columbia Theater.