REGRESSION ANALYSES OF SELF-REGULATORY CONCEPTS TO PREDICT COMMUNITY COLLEGE MATH ACHIEVEMENT AND PERSISTENCE

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ABSTRACT OF THE DISSERTATION

Regression Analyses of Self-Regulatory Constructs to Predict Community College Math Achievement and Persistence

by STEPHEN PETER GRAMLICH

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Open door admissions at community colleges bring returning adults, first timers, low achievers, disabled persons, and immigrants. Passing and retention rates for remedial and non-developmental math courses can be comparatively inadequate (LAVC, 2005; CCPRDC, 2000; SBCC, 2004; Seybert & Soltz, 1992; Waycaster, 2002). Mathematics achievement historically has been a subject of concern with community colleges, universities, and primary schools (Davis, 1994; MEC, 1997; NCTM, 1989, 2000; Wang-Iverson, 1998). An important statistic of community colleges is that more than 83% of students work full or part-time (NEDRC, 2000; Phillippe & Patton, 2000). Conventional homework time estimates can range from 1-3 hours of homework for every hour of in-class instruction. Self-regulatory learning has been proposed to improve opportunity for math achievement (Bembenutty, 2005; Ironsmith et al., 2003; Jones & Byrnes, 2006; Pajares & Graham, 1999; Schunk, 1990).

Seventeen research questions were made to explore the relative influences of goal setting, time planning, and time usage on mathematics achievement and persistence. Math students from 8 classes at a large, northeastern community college were administered 3 surveys asking self-regulatory questions. Results were found from descriptive statistics, frequency distributions, correlation matrices, t-tests, multiple regressions, and logistic regressions.

Goal setting and time management were significant contributors in the model for predicting non-remedial students' final average. With respect to remedial students' final average, goal setting was related but all of the time planning and usage variables were not. Non-remedial students may have been more realistic about their course goals. However, non-remedial students were overly optimistic about allocating their time. No practical information regarding math student persistence beyond the first exam was found. Notable statistics from this study included: students spent about 5 to 6 hours per week on their math homework and over 80% worked at least 15 hours per week. Students worked more job hours on average than on all class homework. A possible recommendation to improve achievement is an extra class time for doing homework. Another implication is math educators, first-year workshops, and textbooks could teach the skills necessary for students to create suitable time management schedules and strategies that support students' course goals.

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CHAPTER I: INTRODUCTION

The Growth and Need of Early Collegiate America

"Genius without education is like silver in the mine."
-Benjamin Franklin (from Moncur, 1994)

Benjamin Franklin was a prominent figure in United States history who inspired generations and who serves as an inspiration for this research. A visionary of education accessibility, in 1731, he founded the first public library of America in Philadelphia (Meiss, 2004). In 1749, Franklin wrote and circulated a pamphlet titled "Proposals for the Education of Youth in Pensilvania," (Franklin, 1749; Thattai, 2001) which would contain "Hints" (Franklin, 1749) toward a different educational plan that would eventually come to define the modern liberal arts curriculum in America. The self-educated Franklin had little formal education and exemplifies the self-regulated learner for which this dissertation is based.

Colleges prior to the 18th century were private and only affordable to the affluent. In 1870, half of the children in the United States had no formal education (Davidson, Gienapp, Heyrman, Lytle, and Stoff, 1990, p. 705) and in 1900, only 6% of teenagers graduated from high school (Thattai, 2001). However, "an unprecedented wave of immigration flooded American shores" (Davidson et al., 1990, p. 658) and education became a means for assimilation (Davidson et al., 1990, p. 705). State legislations enacted compulsory education laws for children under the age of 16 (Davidson et al., 1990, p. 705; Thattai, 2001). Franklin's proposal (Franklin, 1749) of a more "ornamental" curriculum which included "arithmetick," sciences, history, physical education, and the teaching of English would also come to realization.

Technological and industrial advances of the 19th and 20th centuries created a demand for skilled laborers and gave birth to a managerial revolution (Davidson et al., 1990, pp. 646-660). The United States eventually faced global economic competition and the impetus for a more science educated America came as a result of rivalry with Soviet Union (Geller, 2001; Jenner, 2003). Further, a new trend in career aspirations had evolved among children. A *Literary Digest* survey in 1931 (Davidson et al., 1990, p. 953) revealed "by the age of 18… boys looked forward to being lawyers, engineers, and architects… instead of cowboys, aviators, and army officers... girls as stenographers and secretaries… instead of movie stars."

The 20th century saw a rapid growth of high schools, teacher institutes, vocational education, citizenship schools and the rise of community colleges (American Association of Community Colleges [AACC], 2004). Significant events such as: 1907-1917 California legislation for junior college support, the Depression of the 1930's, The Servicemen's Readjustment Act ("The GI Bill"), the 1947 Truman Commission Report, the "baby boom," and the Higher Education Act of 1965 (amended 1972 and 1992) would foster the growth of the two-year college system and propel community colleges into wide spread popularity (AACC, 2004; Davidson et al., 1990, pp. 1102-1103; Geller, 2001, p. 6; National Archives and Records Administration [NARA], 2001; Phillippe & Patton, 2000, p. 5). Franklin's vision of education accessibility for everyone had come to fruition.

Education in America had grown so appreciably that by 1996, 85% of teenagers graduated high school and by the end of the century, 60% of Americans from the ages of 18 to 24 were enrolled in about 3500 four-year and two-year colleges (Thattai, 2001). NCTM (National Council of Teachers of Mathematics [NCTM], 1989, p. 3) adjudged:

"Schools… are a product of the industrial age."

The Characteristics of Modern Public Community Colleges

"An investment in knowledge always pays the best interest."
-Benjamin Franklin (from Moncur, 1994)

> In the last 30 years, various United States presidents have remarked on the importance of community colleges (Witt, Wattenbarger, Collattscheck, & Suppiger, 1994, as cited in Geller, 2001, pp. 7-9):
>
> > President Nixon in 1974 stated, rather rhetorically, "other forms of postsecondary education such as a two-year community college... are far better suited to the interests of many young people." (p. 229)
> >
> > President Reagan referred to community colleges as "a priceless treasure – close to our homes and work, providing open doors for millions of our fellow citizens...the original higher education melting pot." (p. 264)
> >
> > President Bush in 1989 made the first presidential visit to the AACC and spoke about the great example community colleges had set in the educational community and that for "this and all that you are doing, you are earning the gratitude of a nation." (p. 265)

In some states, community colleges (also hereto referred as 2-year colleges) serve as much as 6 to 9% of the population aged 18 or older (Phillippe & Patton, 2000, pp. 16-19). At the turn of the century (1999-2000), Horn, Peter, and Rooney (2002) estimated 42.1% of all undergraduates were enrolled at public 2-year institutions. In 2002, based on data from the National Center for Education Statistics [NCES] (NCES, 2004, Table 172), public community college enrollment was almost half (49%) of total public college enrollment. Projected community college enrollments are expected to continue to increase (Phillippe & Patton, 2000, pp. 140 & 147).

> Reasons for choosing a public 2-year school are varied. Phillippe and Patton (2000) allude to: low tuition, location, open admissions, comprehensive course offerings, flexible class schedules, and opportunity for lifelong learning as reasons for attending community college (pp. 6-9, 22, 52). Schrof (n.d.), in a case study, examined why a top honor student in Ohio chose a community college over a high-quality four-year school. Explanations given were: lower cost, closer to home, smaller classes, faculty having more emphasis on teaching, closer relationship with professors, and courses in the first 2 years at a community college "essentially the same" as at any liberal arts institution (Schrof, n.d., p. 70).

The characteristics of people attending community colleges are as varied as the reasons for going. Low costs attract those that are financially disadvantaged. Convenient locations and flexible class schedules make it possible for people to stay close to work and for mothers to be accessible to young children. Open admissions allow for workers to go back to college to enhance occupation skills and for the unemployed to obtain job readiness. Absence of selective admission standards permit students with low grades, low achievement scores, and learning disabled people to have the opportunity to earn an Associate's degree, professional certificates, license credentials, or transfer to a 4-year institution. Comprehensive course offerings make it possible for immigrants to learn English as a second language and for senior citizens to continue lifelong learning.

The Remedial Education Standard

"He that won't be counselled can't be helped."
-Benjamin Franklin (from Moncur, 1994)

An important function of community colleges is for students to be able to complete prerequisites for more advanced courses and more advanced degrees. The offering of remedial education has become a main constituent. "Community colleges have distinguished themselves in their willingness to provide basic computation, composition, and reading classes to help students meet their ultimate goals" (Phillippe & Patton, 2000, p. 7). The purpose of remedial, also known as developmental education, is to offer classes in reading, writing, and mathematics for students that do not do well enough on basic skills placement exams or have deficient knowledge for placement into certain higher level courses of the institution. The number of students taking at least one remedial class has been increasing since 1976 (Cuseo, 2003, p. 5). NCES (2004, Table 310) estimates for the 2003-4 school year, that 99.5% of all public 2-year colleges offered remedial services. In the Fall 2000 semester, 42% of the approximate 1 million freshman entering public 2-year colleges, enrolled in remedial reading, writing, or mathematics courses (Parsad & Lewis, 2003, p. 18).

Remedial courses at some colleges are graded on a “Pass/Fail” basis and subsequently don’t count toward a degree because they are considered subjects that are prerequisites for college-level study. Students are often permitted to retake a remedial course if they fail and the failing grade sometimes does not weigh on a student’s GPA. It is important to note that criteria for passing and grading, as well as what is defined to be remedial, differs from institution to institution.

In 1995, Roueche, Roueche, and Ely (2001, p. 525) determined that developmental students at the Community College of Denver were as likely to graduate as non-developmental students and identified developmental education as a predictor of success (graduation/transfer). Nonetheless, since 1997, while the number of remedial services has been increasing for public 2-year institutions, it has been decreasing for all other degree granting institutions (NCES, 2004, Table 310). Phillippe and Patton (2000, pp. 7-8) stated:

> Because of the high number of remedial students and colleges’ tight budgets, many community colleges are wrestling with several questions:
>
> How many times should a student be allowed to repeat a course?
>
> When space is limited, should preference be given to the student who needs just one remedial course or the one who needs several?
>
> Who should bear the costs of these developmental programs?
>
> How should other aspects of colleges’ missions be maintained when their role as remediators is increasing?

The Mathematics Problem

"He that is good for making excuses is seldom good for anything else."
-Benjamin Franklin (from Moncur, 1994)

Low Passing and Retention Rates

Parsad and Lewis (2003) reported in the Fall 2000 semester that 97% of 2-year public institutions offer remedial courses in mathematics. In the Fall 2000 semester, 35% of the approximate 1 million freshman entering public 2-year colleges, enrolled in remedial mathematics courses (Parsad & Lewis, 2003, p. 18). While the demand for remedial math courses is substantial, failure rates at institutions may be considerable for both remedial and non-remedial math courses, especially when compared to non-math courses (Community College of Philadelphia Research and Development Committee [CCPRDC], 2000; Los Angeles Valley College Office of Planning and Research [LAVC], 2005; Santa Barbara City College Institutional Research [SBCC], 2004; Seybert & Soltz, 1992; Waycaster, 2002).

In a 1992 survey of 466 Johnson County Community College students (Soltz, 1992), the most frequently occurring problem reported was difficulty with math (above test-taking and personal problems). As such, passing rates for remedial learners in community college Algebra have been reported as low as 29% (Waycaster, 2002, p. 3). For those who do pass, passing subsequent math courses is problematic (CCPRDC, 2000). Inadequate success rates of developmental math students while taking certain concurrent courses, especially math related, is another alarming statistic (Seybert & Soltz, 1992, p. 26). Implications of studies (Roueche & Roueche, 1993; Seybert & Soltz, 1992) suggest that developmental math students should not take math-related courses (i.e. Economics, Chemistry) until after completing developmental work.

Mathematics courses seem to be a trouble spot and hindrance to course requirement completion for not only remedial learners but students in general, especially in comparison to other disciplines (LAVC, 2005; SBCC, 2004). Nonetheless, drop out rates can be high in both remedial and non-remedial math courses (LAVC, 2005; SBCC, 2004; Waycaster, 2002). National average retention rates of high-risk students in 2-year public institutions have been reported to be 52% (Roueche & Roueche, 1993, p. 237), although award winning programs for at-risk community college students mention successful retention estimates from 73 to 97% (Roueche & Roueche, 1993, pp. 221-232).

Consequences

Passing remedial math is critical for obtaining the necessary prerequisite knowledge to be able to move on to higher level courses, in addition to fulfilling degree requirements. Students failing remedial math have to retake these courses and thus, delay advancement to core degree requirement courses especially in areas such as science and business. This can create a burden for students and make satisfying quotas difficult in high demand career fields (i.e. allied health and information technology programs as identified by McPhee, 2004), especially fields that require basic math skills or require passing standardized job tests (see Mosle, 1996). Waycaster (2002, p. 1) warned: "The alternatives to remediation can range from unemployment and low wage jobs to welfare participation and incarceration, all of which are more expensive to society."

Nevertheless, math is typically a general education requirement for any major. Yet only a small amount of degrees are awarded in mathematics. For the 2002-3 academic year, NCES (2004, Table 248) reported that Associate degrees in Mathematics accounted for less than 1% of all Associate degrees conferred. This may leave a void in careers that require Math degrees such as teachers, programmers, engineers, or researchers.

<u>Causes</u>

The National Council of Teachers of Mathematics (NCTM, 2000, p. 20) pointed out that learning mathematics has been “a persistent problem since at least the 1930s…” Reasons for the problem of such low success rates in college math courses vary: under-preparedness from primary or secondary school, poor study skills, lack of standardization, teachers with insufficient language/explanation skills, poor textbooks, underly/overly rigorous course content, math/test anxiety, not taking math courses in a timely manner, and insufficient self-regulatory strategies (Arem, 2003; Bembenutty, 2005; CCPRDC, 2000; Davis, 1994; Ironsmith, Marva, Harju, & Eppler, 2003; Jones and Byrnes, 2006; McEwan, 2000; Mid-Atlantic Eisenhower Consortium [MEC], 1997; Mosle, 1996; NCTM, 1989, 2000; Pajares & Graham, 1999; Pintrich, 1995; Rumbaut, 1996; Schunk, 1990; Thattai, 2001; Wang-Iverson, 1998). A publication by The National Council of Teachers of Mathematics (NCTM, 2000, p. 5) mentioned the following specific reasons in American schools: lack of opportunity to learn important math, boring curriculums, lack of student commitment, and variable teaching quality.

Much research contends that the problem with mathematics achievement stems from primary school and that students do not take courses in secondary school which will adequately prepare them for college study (Davis, 1994; MEC, 1997; Mosle, 1996; NCTM, 1989, 2000; Thattai, 2001; Wang-Iverson, 1998). Two reports, *A Nation at Risk*, 1983 and *The Third International Mathematics and Science Study* (TIMSS), 1995 reported that U.S. primary school students score below the international average in mathematics (MEC, 1997, p. 9; NCTM, 1989; Thattai, 2001). The Mid-Atlantic Eisenhower Consortium (MEC, 1997, pp. 11, 60-61) points to heavy tv watching, uninterested students, differing academic abilities, and disruptive students as circumstances which limit teaching effectiveness in U.S. schools. More hours spent television watching has been negatively associated with higher grades, test scores, and aspirations for the future (Rumbaut, 1996). Furthermore, parental control of tv watching is a positive predictor of math achievement (Bembenutty, 2005).

Reforms

Some reforms have been recommended to deal with these problems. Thattai (2001) mentioned: "States have implemented reform strategies that emphasize more frequent testing conducted by states, more effective state testing, and more state-mandated curriculum requirements." For collegiate developmental education, Waycaster (2002, p. 1) supports standardizing tests, objectives, exit criteria, and assessment methods across the state. Davis (1994, pp. 10-22) recommends that in order for changes to occur in any mathematics programs, one has to look at (1) students, (2) human development, (3) prevailing notions about knowledge and learning, (4) structure of schools and instructional programs, and (5) within mathematics.

These concerns have been the focus of the National Council of Teachers of Mathematics (NCTM) since its inception in 1920. In 1989, NCTM (1989, p. 2) proposed standards "(1) to ensure quality, (2) to indicate goals, and (3) to promote change." As previously discussed in this discourse, the large educational system in America was chiefly a result of industrialization (Davidson et al., 1990; Jenner, 2003; Thattai, 2001). Nevertheless, NCTM (1989, pp. 3-5) warns that new societal goals have emerged since the industrial age: need for more mathematically literate workers, lifelong learning, opportunity for all, and informed electorate. NCTM (1989, pp. 5-6) also alludes to new goals for students: learning to value mathematics, becoming confident in one's own ability, becoming a mathematical problem solver, learning to communicate mathematically, and learning to reason mathematically. The challenge is in accomplishing these goals.

Another decade later, NCTM (2000, pp. 11-27) discussed 6 principles which would yet again set standards for high-quality mathematics programs. The Equity Principle (NCTM, 2000, pp. 12-13) established high expectations for low-income students, non-native English speakers, students with disabilities, females, and nonwhites. The Curriculum Principle (NCTM, 2000, pp. 14-16) called for a sophisticated, well articulated curriculum which challenges students, prepares them for future study, and includes solving real-world phenomena problems. The Teaching Principle (NCTM, 2000, pp. 16-19) required that math instructors know different kinds of mathematics, variances in students' learning, and pedagogical strategies. The Learning Principle (NCTM, 2000, pp. 20-21) warned that students should understand math concepts and not just memorize procedures so that they can eventually become autonomous learners. The Assessment Principle (NCTM, 2000, pp. 22-24) contended that feedback be used as a tool for teachers to make instructional decisions and to help students set goals. The Technology Principle (NCTM, 2000, pp. 24-27) referred to the benefits of using calculators and computers especially for physically challenged students, but warned they should not be used as a replacement for understanding concepts.

The Mid-Atlantic Eisenhower Consortium (MEC, 1997, p. 10) criticized that few

U.S. math teachers apply reform recommendations in their classrooms. Mosle (1996) reasoned that standards meet resistance from both liberal and conservative sides.

> Progressive educators worry that a national curriculum would lead to more rote learning, unimaginative teaching, and a greater reliance on standardized tests. Conservatives, who you might think would cozy up to standards, are deeply suspicious of any sort of outside meddling in their neighborhood schools. (p. 47)

<u>Recommendations</u>

Many reforms discussed place accountability on the institutions and teachers, while others place it elsewhere. In addition to improving the quality of instruction to foster math achievement (Jones & Byrnes, 2006), other research indicated: students spending sufficient time on homework (Cooper, Lindsay, Nye, and Greathouse, 1998; Jones & Byrnes, 2006; Rumbaut, 1996); more parental involvement (Kim & Placier, 2004); and more parental reactive involvement (Bembenutty, 2005).

Beyond parental involvement, teaching math students how to enhance their own motivational beliefs and to engage in self-regulated learning was the recommendation after a study of 343,900 tenth graders (Bembenutty, 2005). Techniques to motivate math students involve: completing student's desire to learn, increasing student knowledge, challenging intellectually, indicating usefulness of a topic, recreational games, historical story telling, satisfying curiosity, and presenting unusual class materials (Posamentier & Stepelman, 1990, pp. 38-43). Metacognitive strategies involving self-regulatory behaviors, time management, and goal setting are recommended to improve motivation, efficacy, and math anxiety issues (Bembenutty, 2005; Ironsmith et al., 2003; Jones & Byrnes, 2006; Pajares & Graham, 1999; Pintrich, 1995; Schunk, 1990). Higher levels of self-regulation have been positively correlated with math achievement (Bembenutty, 2005; Jones & Byrnes, 2006; Pajares & Graham, 1999). Jones & Byrnes (2006) suggested with respect to socioeconomic status:

> low-income 6-year-old children with inadequate levels of prior knowledge will not benefit from programs that merely provide access to better opportunities (e.g., voucher programs and busing). These programs need to be combined with efforts that increase knowledge levels and self-regulatory behaviors *prior to* the time children enter into the high quality environments… (p. 341)

Research has also found that students who have higher amounts of self-efficacy (Bembenutty, 2005; Ironsmith et al., 2003; Pajares & Graham, 1999), lower levels of frustration (Jones & Byrnes, 2006), and lower anxiety (Pajares & Graham, 1999; Ironsmith et al., 2003) perform better on math measurements. Nevertheless, goal attitudes can influence changes in math anxiety and confidence (Ironsmith et al., 2003). "Teaching learners how to enhance their self-efficacy beliefs may help them to overcome cognitive blocks induced by low motivation or low interest" (Bembenutty, 2005, p. 8). Davis (1994, p. 24) warned that if students do not have early learning experiences "that will enable them to learn algebra with more power, more pleasure, more success, and a better outcome all around" then they may learn to "hate mathematics … cannot deal with mathematics" and even wind up hating school.

Another viewpoint implicit from research previously cited and other research that will be discussed in more detail later, (Kirby, Ross, & Puffer, 2001; Macan, Shahani, Dipboye, & Phillips, 1990; Pintrich, 1995; Soltz, 1992) is that students may not have enough time to do their math homework and end up taking fewer math courses (Singh & Ozturk, 2000). Students may work full or part-time jobs, have sport or club obligations, family commitments, and heavy work loads from other classes. Thus, time management is deserving of inquiry. These issues will now be discussed in more detail with respect to community colleges.

The Issues

"He that lives upon hope will die fasting."
-Benjamin Franklin (from Moncur, 1994)

Although community colleges have their advantages, they have their disadvantages too. With such diverse populations, failure in remedial education can pose a danger to at risk groups such as those that were academically under-prepared in high school, those returning to school after a long hiatus, and students with language barriers. Consequences include timeline delays and threats to obtaining degrees and credentials. Returning adults, under-prepared first time freshman, student athletes, people with family responsibilities, and working people may have problems with managing their time. With these groups, because of remediation, the longer time expected to get a degree and previous negative experiences may affect achievement goals and confidence.

Time Management Issues

"Community college students are more likely than their counterparts at four-year institutions to balance work and family responsibilities" (Phillippe & Patton, 2000, p. 8). For the 1999-2000 academic year, the National Education Data Resource Center (NEDRC, 2000, Table 44) reported more than half (53.8%) of all public 2-year college students work full-time and 30.4% work part-time. The average amount of hours worked per week was 36 (NEDRC, 2000, Table 44). Phillippe and Patton (2000, p. 48) reported that during 1995-96, 50.4% of all community college students worked full-time while 33.4% worked part-time.

Another role of the community college is workforce development. State programs are setup to allow unemployed persons or welfare parents to get free or reduced tuition at community colleges. In order to receive benefits, some states require a 20-40 hour per week activity schedule to be used for job, work search, educational or study time (Kirby et al., 2001; Pandey, Zhan, Neely-Barnes, & Menon, 2000).

Therefore, class time scheduling is an important consideration for both employed persons and welfare recipients. “The multitude of community college courses and the various times they are offered- morning, afternoons, evenings, and weekends- allow working people to fit higher education in their schedules” (Phillippe & Patton, 2000, p. 24). However, students still find it difficult to manage their time. Geddes, Golbetz, and the San Diego City College, CA Counseling Department (1992) conducted a survey on factors for students dropping out. The 3 most identified reasons were: 1) too big of homework load, 2) income loss, and 3) to work more job hours.

Allocating time for studying can be a challenge for all types of students but especially those with full-time jobs, family responsibilities, or athletic commitments. One out of four students missed at least 1 class because of work (Soltz, 1992, p. 6). Bradley (2006, p. 489) reported that about 87% of university students work about 15 hours per week. Macan et al. (1990, p. 763) found that university students spent on average 47 hours on school activities, 10.2 hours on housework activities, and 35 hours on employment activities. Another survey (Soltz, 1992, p. 8) found that community college students spent about 24.3 hours per week on school related activities (12 hours in classes, 11 hours doing homework, and 1.7 hours in the library), 25.4 hours on home activities (parenting, family, house maintenance), and 22.9 hours per week working outside the home. Community college students with higher GPA’s spend less time socializing, watching tv, and engaging in sports (Soltz, 1992, p. 7).

Some college courses call for a homework to class time ratio. For example, Rutgers University's Math 025 "Elementary Algebra" syllabus (Rutgers University Mathematics Department [RUMD], 1998) stated that remedial students were expected to "put in 3-4 hours of study time for every hour spent in class" and that "study time would increase beyond the 3:1 ratio, one to two weeks before each exam, and two to three weeks before the final." Others recommended at least two hours of math homework for every hour of class time (Bittinger, 2003, p. 154; Frisk, 1998; Truchon, 1997, p. 3).

In welfare-to-work programs, states such as Michigan and Wisconsin permit a 10:10 ratio-10 hours of study time for every 10 hours of class (and 10 hours of employment), while Missouri and Tennessee allow a 1:1 ratio and California calls for a 2:1 ratio (Kirby et al. 2001, pp. 27-30; Pandey et al., 2000, pp. 120-127). If certain courses expect higher homework to class hour ratios, then this a contradiction to state welfare study time mandates. Kirby et al. (2001, p. 48) stated that some welfare to work participants, especially parents of infants, found educational training "too difficult to manage" with work related activities and reasoned (2001, p. 32) "if an infant is sick, a parent may have difficulty taking time off from work but may be excused more easily from education, training…" Another ramification of juggling education with work related activities among welfare to work participants was the claim of "being too tired to parent well" (Kirby et al., 2001, p. 232).

Expectation Issues

Low expectations can be an issue for not only welfare recipients, but for returning adults after hiatus, first-time freshman, remedial students, and the disabled. Fear of failure, feelings of inadequacy, and past resentment are traits of the developmental student that can impede success (Roueche et al., 2001). Low self-efficacy and low expectations have been associated with low GPA's and low retention (Ironsmith et al., 2003; Locke & Latham, 2006; Schunk, 1990; Pajares & Graham, 1999; Prohaska, 1994; Robbins, Le, Davis, Carlstrom, Lauver, & Langley, 2004).

Previous high school experience can also affect students' expectations for college. For example, Prince George's Community College (Prince George's Community College, Largo, MD. Office of Institutional Research and Analysis, 1993, p. 6) reported that half of their incoming first-time freshman spent less than 3 hours per week on homework in high school. Again if higher homework to class time ratios are required in college, then these type of students may have a tough time adjusting to the new routine.

Another consequence of the open-door policy of community colleges is students entering with disabilities. Students with disabilities are more likely to choose a 2-year rather than a 4-year college and take more remedial courses than non-disability students (Horn, Berktold, & Bobbitt, 1999). Learning disabilities accounted for about 37% of all disabilities reported at community colleges in 1995 (Phillippe & Patton, 2000, p. 47). Learning disabled students may require slower paced instruction, un-timed tests, or distraction free settings. Other disabilities found in a community college classroom are (Phillippe & Patton, 2000, p. 47): orthopedic, chronic illness, emotional/behavioral disorders, and physical impairments. Rapid pace course content, especially mathematics, can be a challenge for some of these students. Hence, disabled students can also have low expectations.

Dealing with the Issues

Pintrich (1995, p. 10) stated that it's not faculty's role to try to "improve students' global self-esteem" but they "should strive to make students believe they can master the content knowledge and reasoning strategies that are used in their disciplines." Nevertheless, students need time for their social and emotional development. A time management schedule enables a student to make time for activities such as recreation, in addition to time for studies and employment. Appropriate time planning has been recommended for academic achievement (Arem, 2003; Bittinger, 2003; McEwan, 2000; Pintrich, 1995). Perceived control of time has been related to less stress (Chu & Choi, 2005; Macan et al., 1999), lower avoidance coping (Chu & Choi, 2005), less depression (Chu & Choi, 2005), and higher life satisfaction (Chu & Choi, 2005; Macan et al., 1999). Further, time management has been found to be positively correlated with GPA (Britton & Tessor, 1991; Chu & Choi, 2005; Macan et al., 1999).

Roueche et al. (2001, p. 526) contend that metacognitive instruction involving goal setting is "critical" to academic and personal success for developmental students. McEwan (2000) advocated goal setting as a practice that teachers should encourage more often (p. 42) and that timelines should be established for setting goals (p. 91). Arem (2003, p. 5) recommended goal setting as a first step to reducing math anxiety and fording opportunity for achievement. The act of writing goals down influences people to make a commitment (Cialdini, 1988, p. 77). Research has suggested that goals are linked to better self-efficacy (Hagen & Weinstein, 1995; Schunk, 1990), motivation (Dweck, 1986), and achievement (Britton & Tesser, 1991; Ironsmith et al., 2003; Robbins et al., 2004).

Some students do not set appropriate goals or employ time management schedules for themselves. They may have never been taught the behaviors that are needed for academic achievement (Trawick & Corno, 1995). Trawick and Corno (1995, p. 58) contend that urban community college students may have previously had limited exposure to effective strategies for managing learning-related effort and limited access to role models. Some of these students set high career goals in high school, such as doctors, computer scientists, or engineers and "yet they do not come to class regularly, make no real effort to learn algebra when they do come, and almost never do any homework… what one gets from them is a verbal formula… the words do not describe a realistic set of plans and behaviors and heartfelt personal goals" (Davis, 1994, p. 26). Notwithstanding, those that do set goals may not have a strategy for achieving them.

To deal with these issues, programs have been designed to help students learn to set goals, create time management schedules, set strategies, build academic confidence, and self-evaluate (Cuseo, 2003; Trawick & Corno, 1995). Some colleges set up first year courses and workshops in study skills that aim to establish cognitive routines that will guide students to success in their college careers (Cuseo, 2003). Other enhancement programs are setup to advise students on how to study and negotiate the particular demands of college (Trawick & Corno, 1995). "Collaboration among different organizational units and members of the college community" such as student peers, instructors, academic support services, Divisions of Academic and Student Affairs, and College-Primary School "are critical to effectively address the full range of issues that affect students' academic success during the first year of college" (Cuseo, p. 8). Engaging in goal setting and implementing a time management plan were advantages of a seminar for first-year college students (Cuseo, 2003, pp. 32-41). Cuseo (2003) cited research which supports the notion that "academic habits established during the first year may have long-term impact on students' level of academic involvement throughout their remaining years in college" (p. 5).

Students' learning of these habits need not be restricted to programs and workshops. Goal setting, managing time, and self-monitoring are part of what is called Self-Regulated Learning ("SRL"). Pintrich (1995, pp. 8-9) argued that SRL is both "appropriate" and "teachable" in any type of college classroom context. SRL has been found to predict academic achievement (Britton & Tesser, 1991; Macan et al., 1990; Robbins et al., 2004) and mathematics achievement (Bembenutty, 2005; Ironsmith et al., 2003; Jones & Byrnes, 2006; Pajares & Graham, 1999; Schunk, 1990).

Chapter Summary

In this chapter, we have seen the historical significance and characteristics of community colleges. Students having problems passing math courses can adversely affect their opportunity for obtaining a degree and society at large. Community college students can have great demands on their time and have low expectations for achievement. SRL has been recommended as a success strategy. Therefore, this study aims to find out if SRL (goal setting, time planning, and various uses of time) can predict community college math achievement and persistence. The literature regarding SRL will be reviewed in much more specific detail in the next chapter.

CHAPTER II: LITERATURE REVIEW

Self-Regulated Learning

"Energy and persistence conquer all things."
-Benjamin Franklin (from Moncur, 1994)

Goal setting and time management are aspects of self-regulated learning. The research pertaining to these two facets will be expanded and discussed in this chapter. Schraw and Brooks (2000) defined self-regulated learning as "students' ability to understand and control their learning," elucidating that it is "essential for success in college math and science courses." Pintrich (1995, pp. 7-9) explained that SRL can be learned, is controllable, is appropriate to the college context, and is teachable. The benefit of self-regulated learning is its ecological validity which makes it more closely related to the classroom than traditional psychological research (Pintrich, 1995, p. 9). Furthermore, self-regulatory factors have been found to predict academic achievement (Britton & Tesser, 1991; Macan et al., 1990; Robbins et al., 2004). More pertinently, self-regulatory variables have been found to be associated with math achievement (Bembenutty, 2005; Ironsmith et al., 2003; Jones & Byrnes, 2006; Pajares & Graham, 1999; Schunk, 1990).

SRL includes aspects of cognition, self-efficacy, motivation, and metacognitive strategies. There are three general aspects of academic learning involved in self-regulation (Pintrich, 1995, p. 7): 1) control of student resources, 2) control of motivational beliefs, and 3) control of cognitive strategies. For the purposes of this study: controlling resources include study time (time management) and study environment; controlling motivational beliefs include goal orientation and self-efficacy; and controlling cognitive strategies involve using deep processing strategies for better learning and performance.

Most of the SRL research concerns school children and adolescents (i.e. Ames, 1992; Bembenutty, 2005; Dweck, 1986; Jones & Byrnes, 2006; Pajares & Graham, 1999; Schunk, 1990). College SRL research primarily constituted psychology courses (i.e. Britton & Tesser, 1991; Linnenbrink, Ryan, & Pintrich, 1999; Prohaska, 1994; Svanum & Bigatti, 2006). SRL research involving community college math courses was found in Ironsmith et al. (2003) and the studies pertaining to self-regulatory math achievement used high school student samples (i.e. Bembenutty, 2005; Jones & Byrnes, 2006; Pajares & Graham, 1999). Self-regulation in relationship to course achievement can be distinguished by discipline (Vanderstoep, Pintrich, and Fagerlin, 1996). However, not much literature existed where self-regulation was geared toward the cognitive aspects of a specific course subject.

The basis for the theoretical model for this study was provided by Schraw and Brooks (2000, Figure 1) in Figure 1.

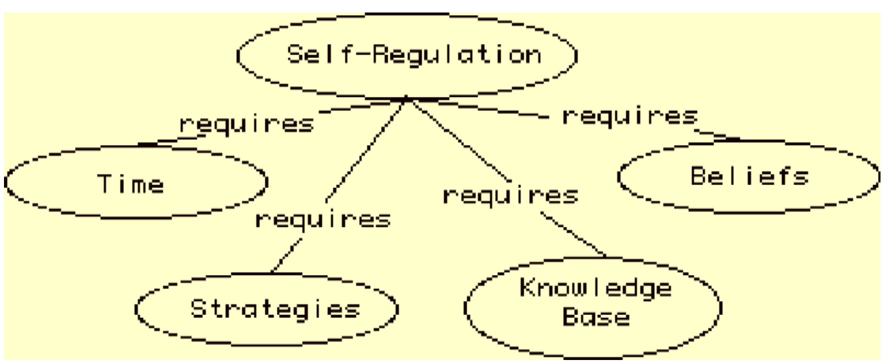

Figure 1. Self-regulation.

The diagram above shows factors that encompass self-regulation. Each of the factors will be discussed with respect to Pintrich's (1995) three aspects of self-regulated learning. The result of self-regulation is task specific outcomes. Outcomes in learning may include memorization and obtaining achievement goals.

Control of Motivational Beliefs

"Do not anticipate trouble, or worry about what may never happen.
Keep in the sunlight."
-Benjamin Franklin (from Moncur, 1994)

Goals

Locke and Latham (2006, p. 267) argue that "a goal, once accepted and understood, remains in the periphery of consciousness as a reference point for guiding and giving meaning to subsequent mental and physical actions." Hagen and Weinstein (1995, pp. 51-52) recommended the following for applying goals to teaching and learning: goals should be realistic (see also Schunk, 1990), broken down into long and short term, and encouraged by teachers. Goals that are specific, high, and difficult can lead to higher levels of effort, persistence, and performance than a vague goal (Locke & Latham, 2006). Specific, self-set, challenging, and proximal goals can also help performance, self-efficacy, and motivation (Pajares & Graham, 1999; Schunk, 1990). Academic goals can predict GPA, retention (Robbins et al., 2004) and course grade (Ironsmith et al., 2003).

However, some researchers have found setting goals to not be a significant predictor of GPA (Macan et al., 1990). Others have found academic goals to only contribute marginally to GPA and account for less variance than other factors such as self-efficacy and motivation (Robbins et al., 2004).

The review of research regarding educational achievement goal setting primarily differentiates between two types of goals: mastery and performance goals (Ames, 1992; Hagen & Weinstein, 1995) or also referred to as learning and performance goals (Ames, 1992; Dweck, 1986, 1992; Locke & Latham, 2006; Sabee & Wilson, 2005). Mastery goals focus on mastering the course material while performance goals focus on obtaining a desired grade in the course (Hagen & Weinstein, 1995, p. 43). Learning goals seek to "improve competence" while performance goals seek to "prove competence" (Dweck, 1992, p. 165).

Students with mastery goals tend to use more effective learning strategies (Pintrich, 1995) and have higher self-efficacy than those with performance goals (Hagen & Weinstein, 1995). Mastery goals also increase time on task, persistence, and quality of engagement (Ames, 1992, p. 262). Learning goals are associated with higher test achievement (Dweck, 1986), better math performance and less math anxiety (Ironsmith et al., 2003) than performance goal oriented students. Linnenbrink et al. (1999) found a positive correlation between mastery goals and working memory capacity (storage and processing of information). Mastery goals are especially necessary in math courses that are prerequisites to higher level courses. Social comparison, test curving, and dropping lowest test grade can interfere with accomplishing mastery goals (Ames, 1992; Hagen & Weinstein, 1995; Pintrich, 1995). Pintrich (1995) recommended focusing on one's own mastery of material rather than competing with others as a way to improve efficacy.

Notwithstanding, students sometimes focus on performance goals rather than learning goals (Ames, 1992; Dweck, 1986). Reasons include performance goals are more closely tied to students' self-worth than mastery goals (Ames, 1992, p. 262; Dweck, 1986). Sabee and Wilson (2005) conducted a study in which 234 college student participants were asked to recall a conversation with an instructor on a "lower-than-desired" grade. The results showed that 66% had the intention of persuading the instructor to change their grade (performance goal) whereas only 9% had a learning goal intention (increasing competence).

Students may have imperfect grade expectations (Prohaska, 1994; Svanum & Bigatti, 2006). Some students are overly optimistic while others are too pessimistic. In one study (Svanum & Bigatti, 2006), 258 undergraduates in 3 abnormal psychology courses were asked to predict their final grades in a course at the start of the semester. The results showed that 70% of the subjects overestimated their final grades, 24% accurately predicted their final grades, and 6% underestimated them. Students' estimates also differed by GPA category. The researchers then categorized the population into two groups: informed and uniformed optimists. Informed optimists were those who expended the effort to achieve the desired result while the uniformed lacked the skills necessary to achieve their desired outcome. Despite the fact that students had been previously informed that typically only 50% earned A or B in the course, 95.5% of the students in the study still anticipated a B or better.

Prohaska (1994) found similar results. A survey was given on the first day of class to 4 different psychology courses (n = 149) asking students to estimate their final grades. Results showed main effects by GPA and by course. Scheffe tests revealed that low and medium GPA students overestimated their grades much more than high GPA students. Low GPA students also had much less confidence in their estimates thus indicating they may have some awareness of their over optimism.

The question arises as to whether teachers should correct these unrealistic expectations or not. Since research shows that high goals and efficacy are associated with better performance and motivation (Locke & Latham, 2006; Schunk, 1990), such an approach may impede rather than foster. Svanum and Bigatti (2006) recommended teachers clearly explain the skills necessary to succeed in the course and include opportunities for their development. This would also support the importance of academic support in the first year college experience as a means of developing a greater sense of self-perceived control of academic outcomes (Cuseo, 2003). Additionally, Cuseo (2003) argues "that the cognitive and behavioral habits students develop during their first-year of college may become their modus operandi for the entire college experience" (p. 5).

Garcia (1995) explained that not all students need to be optimistic learners to be high achievers. "Defensive pessimism" is when a student harnesses anxiety and low expectations to fuel efforts and work harder. On the other hand, "self-handicapping" involves low expectations and withdrawl of effort. Defensive pessimists have higher intrinsic goals, anxiety, rehearsal strategies, and time management strategies than self-handicappers and students in neither category (Garcia, 1995). Defensive pessimists also have better course grades than self-handicappers and equally good course performance to students not classified in either category (Garcia, 1995).

Self-Efficacy

Goal choice is affected by self-efficacy, past performance, and various social influences (Locke & Latham, 2006). Garcia (1995) defined self-efficacy as "students' beliefs about whether they have the ability to successfully master an academic task" (p. 45). "Self-efficacious learners expend greater effort and persist longer than students who doubt their capabilities" (Schunk, 1990, p. 74). Self-efficacy has also been found to be a significant predictor of GPA, retention (Robbins et al., 2004) and math achievement (Bembenutty, 2005; Pajares & Graham, 1999) as seen in the following studies.

A study of 343,900 tenth graders (Bembenutty, 2005) revealed that self-efficacy had the highest correlation with math standardized test score- higher than parental involvement, effort regulation, and motivation. In the hierarchical regression, self-efficacy, effort regulation, and motivation accounted for 14% increment in R^2 after ethnicity, gender, and parental involvement were already entered accounting for 10% of the proportion of variance.

In a meta-analysis of 109 studies (Robbins et al., 2004), regression analyses revealed ACT/SAT scores and high school GPA as the strongest predictors of college GPA, followed by self-efficacy and achievement motivation. Academic goals only contributed marginally to the regression model. However, academic goals contributed significantly (change in R^2 = 8.3%) in predicting retention when the same variables were in the model. Significant positive intercorrelations (corrected for measurement error) were found between academic goals and motivation ($r = .645$), self-efficacy and motivation ($r = .459$), and goals and self-efficacy ($r = .489$).

Again, in another regression analysis of 273 sixth graders (Pajares & Graham, 1999), previous achievement score (Iowa Basic Skills standardized Test), GPA, and self-efficacy were the most significant predictors of math performance (two end-of-unit exams). Self-efficacy was the only significant motivation variable when anxiety, self-concept, self-regulation, and engagement were also in the model. All of these variables had significant correlations with each other and math performance.

<u>Anxiety, Memory, and Motivation</u>

Some studies illuminate psychological constructs akin to self-efficacy, especially with respect to math achievement. Ironsmith et al. (2003) found anxiety and confidence to be more highly correlated with math achievement (course grade and final exam, respectively) than Quantitative SAT score. Jones & Byrnes (2006) also found frustration and fear to be negatively correlated with Algebra achievement. Further, prior knowledge, self-regulation, and frustration accounted for an additional 34% of the variance in the regression model (Jones & Byrnes, 2006). Linnenbrink et al. (1999) found a negative correlation between negative affect (anxiety, depression, frustration) and working memory. However, when negative affect was in the model with goals and gender, task-irrelevant thoughts (difficulty concentrating, thinking about other things) was not a significant predictor of working memory. Pintrich (1995) contended that simple memorization cognitive strategies rather than deeper processing strategies may be a result of high anxiety.

Goals are also related to motivation (Dweck, 1986; Locke & Latham, 2006; Robbins et al., 2004; Schunk, 1990). Different motivational patterns promote goal choice traits (Dweck, 1986). Dweck (1986) differentiates 2 types of motivational patterns: adaptive and maladaptive. Mastery goals elicit adaptive motivational patterns that are associated with maintaining achievement and positive attitudes toward learning, while performance goals elicit "failure-avoiding" maladaptive motivation patterns (Ames, 1992, p. 262). Motivation can be fostered through intrinsic (internal) and extrinsic (external) rewards. With respect to math education, Posamentier and Stepelman (1990, p. 38) informed that extrinsic rewards included: token economic awards, peer acceptance, avoidance of punishment, need for praise; intrinsic rewards included: understanding a topic or concept (task-related), outperforming others (ego-related), or impressing others (social-related). Dweck (1986) contended that "intrinsic motivational factors… may be more difficult to access within a performance goal" (p. 1042).

Both intrinsic and extrinsic interest were found to be significantly correlated with high school math achievement ($n = 343900$, $r = .246$, $r = .139$, respectively; $p < .01$) and to be significant predictors in a regression model with ethnicity, gender, parental involvement, self-efficacy, and effort regulation ($R^2 = .24$, $F = 85426.62$, $p < .01$) (Bembenutty, 2005). Further, achievement motivation has been found be a significant predictor of college GPA and accounted for more variance than academic goals (Robbins et al., 2004). Students are more apt to strive toward better achievement when they view ability as a function of effort (Dweck, 1986). A student needs appropriate time to apply effort and thus, time management is critical.

Relevance to the Study

The research has shown that the underlying psychological constructs of goal setting are somewhat complicated and multi-faceted. Goal achievement can be affected by self-efficacy, past performance, and motivation. Researchers categorize goals and make different recommendations for setting academic goals. Hence, this study seeks to investigate if setting a course goal at the beginning of a course can predict a student's final grade (similar to Prohaska (1994) and Svanum & Bigatti (2006) but with math students instead of psychology students) and how goal setting may be associated with persistence, planned time management, and time usage.

Control of Cognitive Strategies

"Employ thy time well, if thou meanest to get leisure."
-Benjamin Franklin (from Moncur, 1994)

Homework

Better time management has been found to be significantly correlated with higher

GPA's (Britton & Tessor, 1991; Chu & Choi, 2005; Macan et al., 1990). However, students with higher GPA's have been found to not differ in the number of hours they attended class (Soltz, 1992, p.7). Some research contends that better academic performance could be accounted for by more study time (Cooper, 2001; Marlowe, Koonce, Lee, and Cai, 2002) and less procrastination (Chu & Choi, 2005).

One purpose of time management is for students to spend sufficient time reviewing class notes, reading the text, and doing homework. Homework in mathematics is practicing what was taught. Concepts, formulas, algorithms, and examples are presented by the instructor or read from textbook examples. Students then practice what was seen, heard, and read by modeling (Bandura, 1977, as discussed in Lefrancois, 1988, pp. 171-177)). The purpose of practicing is for students to be able to recall this information from memory on a test (retrieval from storage).

Recall of information from memory is essential to educational achievement. Memorization is achieved by the transferal of information from sensory storage (sight, sound, taste) to short term (30 second working memory) through attending (paying attention); then from short term to long term (passive, unconscious) memory by rehearsal and recoding of sensory input (Atkinson & Shiffrin, 1968, as cited in Lefrancois, 1988, pp. 57, 372)). The process of repeating over and over again is called rehearsal (Lefrancois, 1988, p. 65). Encoding is obtained by abstracting information and representing it in another form (Lefrancois, 1988, p. 62). Deeper levels of processing help encoding into long term memory (Lefrancois, 1988, p. 62). Craik and Lockhart (1972, as cited in Lefrancois, 1988, p. 62) presented a model in which memory is dependent on the level to which information is processed. Unprocessed information stays in sensory storage, slightly rehearsed information in short term or working memory, and information that is processed to a greater degree finds its way to long term memory. Doing homework is a process to help facilitate this transformation.

Fading theory dictates that learned material not frequently brought to mind will fade from memory or become distorted (Ausubel, 1963, as discussed in Lefrancois, 1988, p. 70). Ebbinghaus developed forgetting and learning curves which implied that only half of information is retained after 20 minutes of learning and 69% is lost after two days (as cited in Arem, 2003, p. 106). Thus, the sooner a student completes their homework assignment the better the opportunity for memorization.

Another principle that can be linked to homework is related to time on task. The Power Law of Performance model (Newell & Rosenbloom, 1981, as cited in Bagayoko & Kelley, 1994, p. 33) states that as the number of practices increase, the time required to perform the task decreases. The equation is:

$$T = A + B\,(N + E)^{-p}$$

where T represents the time it takes to perform a task, N represents the number of practices, constants B and E represent prior background, p is a constant learning rate, and A is an asymptote which T approaches as N increases (see Figure 2). It can be seen from the equation that T and N are inversely proportional. In an educational setting, the Power Law would infer that the more a student practices a concept, the time taking to do that concept would reduce and thus, the higher level of proficiency.

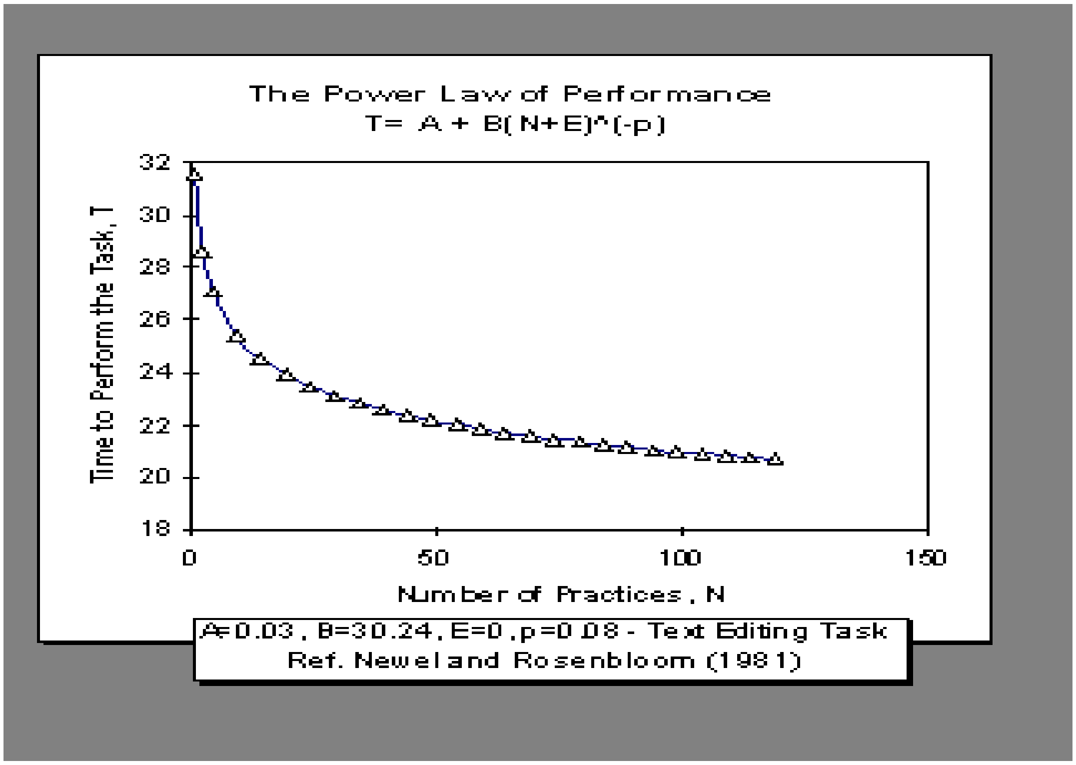

Figure 2

Higher course grades, GPA's, and standardized achievements have been associated with more time spent on homework (Cooper, 2001; Cooper et al., 1998; Kim & Placier, 2004; Marlowe et al., 2002; Rumbaut, 1996; Soltz, 1992). Cooper (2001) reported that those who did more homework had better achievement scores, especially at the high school level. Another study by Cooper et al. (1998) found amount of homework completed to be a significant predictor of grades ($n = 709$, $F(1, 624) = 40.22$, $p < .0001$) and standardized Tennessee (math and English) achievement test scores ($F(1, 583) = 6.88$, $p < .009$). Soltz (1992) reported that students at Johnson County Community College, KS with high GPA's studied an average of 3 hours more per week than those with low GPA's. In a survey of 2,420 new Californians (teenage immigrants or children of first generation immigrants), Rumbaut's (1996) multivariate analysis found "the effort invested in daily homework paid off across the board in higher grades, (math and reading) test scores, and aspirations for the future; by contrast, the hours spent daily watching television were associated negatively with all outcomes across the board."

One of the benefits of doing homework can be seen in higher grades, especially in math courses (Jones & Byrnes, 2006). A study by Jones and Byrnes (2006) found a significant positive correlation between algebra achievement and homework grade. Using hierarchical regression, homework grade and working one-on-one with the teacher accounted for 23% of the proportion in variance. However, these variables were not found to be significant predictors when prior knowledge, self-regulation, and frustration were in the overall model.

Furthermore, homework time has been found to predict achievement but not in every subject (Kim & Placier, 2004) and not across all grade levels (Cooper, 2001). More so, some studies find negative effects of homework (Cooper et al., 1998; Dudley-Marling, 2003; Kralovec & Buell, 2000). Student attitudes toward amount of homework assigned can be negatively correlated (Cooper et al., 1998). Other arguments were that homework reinforces social inequities, interferes with family functions and socialization, and can adversely affect learning (Dudley-Marling, 2003; Kralovec & Buell, 2000). Dropping out of school can be a consequence of inability to complete homework (Kralovec & Buell, 2000). Dudley-Marling (2003) remarked, "Whatever the benefits of homework, public debates over homework have given little attention to its potential costs, especially the potential violence homework can do to family routines and relationships."

Relevance to the Study

In this section, a discussion on homework as means to achieving memorization was discussed. Conflicting findings for and against homework time were presented. However, research advocating more homework time to improve performance was more dominant. It was noted in the first chapter, that homework hours to college class hours can range from 1:1 to 3:1 per week (Bittinger, 2003; Frisk, 1998; RUMD, 1998; Truchon, 1997) and these recommended ratios may even conflict with other pre-set ratios (i.e. welfare to work programs which only allow study time in 1:1 or 2:1 ratios (Kirby et al. 2001; Pandey, 2000). It was also noted that students may need to allocate time for other activities (i.e. other classes, parenting, housework, sports, recreational, etc). Therefore, another aim of this study is to find out if indeed, more time spent on homework is related to better college math achievement and how homework time is related to goal setting and other time allocation.

Control of Student Resources

"Never leave that till tomorrow which you can do today."
-Benjamin Franklin (from Moncur, 1994)

Time Management

Britton and Tesser (1991) stated:

> nonacademic life events may cause unpredictable changes in demands, available time, or priorities; instructors may even change their mind about the due date on papers or the date an exam will be scheduled; on occasion, there is no syllabus and even in courses in which there is a syllabus, there are often consequential deviations from it. (p. 409)

Such lack of consistency can cause students much stress. As previously noted, creating a time management schedule is one recommendation to cope with the rigorous demands of college. Lower amounts of stress, avoidance coping, depression, and higher life satisfaction have been correlated with more perceived control of time (Chu & Choi, 2005; Macan et al., 1999). In a study of 230 Canadian undergraduates, Chu and Choi (2005) reported that more passive procrastination was significantly correlated with lower perceived control of time, purposive use of time, self-efficacy, GPA and higher stress, emotion coping, avoidance coping, and depression.

Some time management factors have been shown to contribute more to GPA than traditional aptitude. Britton and Tesser (1991) used a stepwise regression analysis (n = 90) with principal components identified from a 35 item time-management instrument. Time attitudes (entered first, R^2 =. 15, $p < .001$) and short-range planning (time and goals (entered second, increment in R^2 =. 06, $p < .02$) were found to be significant predictors of cumulative grade point average and accounted for more variance than SAT scores entered third (increment in $R^2 = .05$, $p < .03$). Another hierarchical regression was done where SAT was entered first and still did not account for as much of the variance as time attitudes and short-range planning.

However, findings against certain aspects of time management have been found. An interesting finding by Chu & Choi (2005) (from One-Way ANOVA and paired t-tests) was that "active procrastinators"- those that deliberately make the decision to procrastinate to work under last-minute pressure, had better academic performance than "passive procrastinators"- those that do not intentionally procrastinate. Further, active procrastinators and non-procrastinators both had higher levels of purposive use of time, engagement, and higher GPA's (Chu & Choi, 2005). Actively procrastinating implies that students can still achieve academic goals without a regimented time management schedule.

Job

Time management is not only associated with higher GPA but other variables, as well. Macan et al. (1990) reported time management behavior to be significantly correlated with higher performance ratings, GPA, greater job and life satisfaction, less role ambiguity, and less somatic tension. The study also revealed 4 principal components coming out time management behavior: setting goals, planning, perceived control of time, and preference for disorganization. Perceived control of time was identified as the major correlate and was the only factor to be significantly correlated with less role overload and less job-induced tension (both of which time management behavior did not significantly correlate). Nevertheless, the more direct relationship between employment and academic performance will be further examined.

Some research has found a negative correlation between high school GPA and employment hours (Barone, 1993; Singh & Ozturk, 2000). More specifically, in a study of 1057 schools, Singh and Ozturk (2000) found 12^{th} grade high school part-time employment to be negatively correlated with math achievement and amount of math courses taken. A path analysis with SES and previous math achievement in the model revealed significant direct effects of part-time work intensity on both math achievement and courses taken.

Other employment research established better college GPA to be related to 2 groups: those that do not work and those that work 20 hours or more (Bradley, 2006). More so, a regression analysis of 193 students from a southern university (Marlowe et al., 2002) showed that both study time and time spent working for pay to be significant predictors of academic performance. That is, more study hours and more job hours were both related to better course grades. Marlowe et al. (2002) reasoned that students who work more hours at a job "are more conscientious and study more." Part-time students tend to be older, more motivated, spend more hours studying, and obtain better grades than full-time students (Soltz, 1992).

Relevance to the Study

In the first chapter, it was noted that more than 80% of community college students work full or part-time (NEDRC, 2000, Table 44; Phillippe & Patton, 2000, p. 48) and an average of 36 hours per week (NEDRC, 2000, Table 44). Further, students need to allot time for other activities, especially homework. Thus, time management can be important. This study seeks to investigate if a community college student's time management schedule can predict their math grade and persistence. Relationship between amount of hours spent at a job and math achievement will be explored along with other time allotment variables, as well.

Chapter Summary

In summary, the results in the research reviewed were varied. Although the prevailing notion that self-regulation predicts achievement held steady, contrasting findings of certain SRL variables have been presented to exemplify the complexity of SRL and shed an encompassing perspective. A quote by McEwan (2000) from her book *The Principal's Guide to Raising Math Achievement* highlighted:

> The variables that influence achievement are multiple and complex. Many of the most powerful ones are completely out of control of educators, such as socioeconomic status of the neighborhood, parents' educational level, student's readiness to learn, and cognitive abilities… Don't be discouraged, however…. There are half a dozen variables that can be altered in research-based ways to directly influence mathematics achievement…. environmental variables (e.g., teacher morale, student discipline, parent-teacher communication)… Harnessing the energy, creativity, and collective wisdom of your faculty, examine…alterable variables: course content… textbooks… instructional methodologies… expectations… and assess student mastery. (p. 28)

Notwithstanding, most of the math research discussed pertained to primary or secondary school education. In the next chapter, a study will be presented to see to what extent the self-regulation construct involving community college math student's course goal, time-management schedule, strategies, and reflections of study and job time predict their course average. The relationships between goal setting, time management, and persistence will also be analyzed. Based on the literature reviewed, we would suspect that students who set better goals (set a goal and have strategies for achieving the goal), have better time-management schedules (set specific times and days and allocate more hours of study time), spend more hours on homework, less hours on job, less hours on other classes, and report lower math course difficulty ratings would have better math course final average and persistence.

Research Questions

The research questions that will be addressed in this study are:

1. What relationships exist between goal setting, time planning, time usage and remedial mathematics final average?
2. What course goals and achievement strategies do remedial math students plan?
3. What are the characteristics of students' planned time management schedules in remedial math courses?
4. What are the characteristics of students' time usage and reflections in remedial math courses?
5. Does there exist a significant difference between remedial math students' time planned (at the beginning of the semester) and the actual time spent (noted at the end of the semester)?
6. To what extent do goal setting, time planning, and time usage predict remedial math

students’ final average?

7. What relationships exist between goal setting, time planning, and remedial math course persistence?

8. To what extent do goal setting and time planning predict which remedial math students persist and which withdraw?

9. What relationships exist between goal setting, time planning, time usage and non-remedial mathematics final average?

10. What course goals and achievement strategies do non-remedial math students plan?

11. What are the characteristics of students' planned time management schedules in non-remedial math courses?

12. What are the characteristics of students’ time usage and reflections in non-remedial math courses?

13. Does there exist a significant difference between non-remedial math students’ time planned (at the beginning of the semester) and the actual time spent (noted at the end of the semester)?

14. To what extent do goal setting, time planning, and time usage predict non-remedial math students’ final average?

15. What relationships exist between goal setting, time planning, and non-remedial math course persistence?

16. To what extent do goal setting and time planning predict which non-remedial math students persist and which withdraw?

17. Are there any significant differences between remedial and non-remedial math students' goal setting, time management, and time usage?

CHAPTER III: METHODOLOGY

Overview

Drive thy business or it will drive thee.
-Benjamin Franklin (from Moncur, 1994)

In the first chapter, problems with mathematics achievement were discussed and Self-Regulated Learning (SRL) strategies were recommended that could foster success. The review of the research literature presented various findings with respect to SRL. It was noted that some students are familiar with their metacognitive skills while others need to discover effective self-regulatory strategies. The concern of this study is how these strategies and evaluation of student time use are related to community college math achievement and persistence. More specifically, can community college math course achievement (final average and persistence) be predicted from student reported goal strategy, time management schedule, hours spent on homework, job, other class homework hours, difficulty rating of course, and amount of exams desired?

Participants

During the Fall 2005 to Spring 2006 semesters, 3 self-regulatory surveys (a goal strategy survey, a time management schedule, and a time use survey) were administered to 197 students in 3 remedial and 5 non-remedial math courses from a large northeastern, urban, public community college. Enrollment at the college is about 35,000 students (67% are women; 73% are minority: 51% African, 12% Hispanic, 9% Asian, 1% Native) and the median age is 26 years. Of 26,000 students enrolled in credit courses, 57% are considered full-time. Students register in math courses based on the results of their college placement test scores or by passing the necessary prerequisite course. Students placed into remedial learning account for 25% of all courses. Furthermore, demographics and statistics vary by campus.

Procedure

Exemption from Institutional Review Board was granted through Rutgers University Office of Research and Sponsored Programs (FWA00003913). In the first day of the semester, students from 8 math courses (3 "Elementary Algebra" classes, 1 "Intermediate Algebra," 1 "Linear Math," 1 "Data Analysis," 1 "Statistics for Science," and 1 "Probability" class) were administered a survey asking them to state a “goal” for the course and how they’ll achieve it (see Appendix A). Students were asked questions about their background and attitudes, but these responses were not included in the study. Reasons include: the purpose of the study being to inspect the influence of goal strategy irrespective of background and also, for parsimony explained later (Mertler & Vannatta, 2005, pp. 169-170; Pedhazur, 1997, pp. 207, 211; Stevens, 2002, pp. 88, 143). In addition, a “time management” section of the survey was administered in which students were asked to specify the days and times in which they will do their math homework (see Appendix B). The survey and time management schedule was handed in on the first exam day (3-5 weeks later) so as to give students enough time to plan and revamp their schedules. As incentive, participants received 2 extra credits points (toward a test grade) for handing in the survey on the due date. After the due date, 1 extra point was given. Students were verbally made aware in the first day of class that participation in the survey was voluntary and although the survey was just extra credit, sincere responses were encouraged. Other extra credit was available throughout the semester had students chose not to participate. Participants signed the survey agreeing to partake and that they understood their responses would be kept confidential.

Another self-regulation survey on time usage (see Appendix C) was administered at the end of the semester. On the last day of class, students were asked to reflect and report how many hours per week they spent on homework for the math course, hours per week spent on other classes, and hours per week in a job. Other questions regarding how many exams they would have preferred and a course difficulty rating were asked. Students handed in the survey on final exam day (the following week). Again, participants were verbally informed that since their responses would have no bearing on their grade in the course, other than receiving extra credit for participation, honest answers should be given. Participants signed the survey acknowledging that they understood their responses would not affect their grade and that their responses would be kept confidential.

Only the goal question on the first survey was used for analysis. Pedhazur (1997, p. 207) and Stevens (2002, pp. 88, 143) recommend using 15 subjects per independent variable (a 15:1 ratio) for a reliable regression equation. Reasons for using a small set of predictors include (Stevens, 2002, pp. 88, 93-94, 143): 1) law of parsimony (Occam's Razor), 2) better cross-validation, and 3) loss of incremental validity with adding new variables (Lord & Novick, 1968, as cited in Stevens, 2002, pp. 93-94)). Tabachnick and Fidell (1996, as cited in Mertler & Vannatta, 2005, p. 171)) suggested $n >= 50+8k$, where n= sample size and k= # of predictors. For example, in a study with 7 independent variables, a recommended sample size of at least 106 subjects would be apt. Another reason for frugality is to avoid multicollinearity (Mertler & Vannatta, 2005, pp. 169-170; Pedhazur, 1997, pp. 294-295, 317-318; Stevens, 1992, pp. 91-93) which can: 1) extremely limit size of multiple correlation R, 2) confound effects, and 3) inflate standard error and bias test statistics. Multicollinearity could be an issue if there are high intercorrelations among the independent variables (Mertler & Vannatta, 2005; Pedhazur, 1997; Stevens, 1992).

Variables, Instrumentation, and Coding

Independent Variables

There were 21 variables created from the 3 surveys: course goal (GV1), goal strategies (attendance (A), listening (L), studying (S), homework (SH), test prep (ST), time management (MT), tutoring (T)), count of goal strategies (SC), overall goal setting score (GS), time planned (hours (TP, TCE), days (tDs, TD), times (tTs)), overall time management score (TS), number of exams desired (E), job hours (J), math homework hours (H), other class homework hours (O), and course difficulty rating (D).

Dependent Variables

There were 2 dependent variables for the study (Final Average and Persistence). Final average (%) in the class was based upon the average of 4 exam grades (percentage correct), attendance, and extra credit. For each semester that involved the same course, parallel exam forms were used. Persistence was a dichotomous variable coded 1 if the student took the final exam and 0 if not.

Goal Survey

Student responses to a course goal question (Appendix A) were rated. A similar inquiry was used by Prohaska (1994) and Svanum & Bigatti (2006). Goals should be specific (Schunk, 1990), high (Locke & Latham, 2006), and have strategies for achieving them (i.e. modeling, completing homework, etc.) (Hagen & Weinstein, 1995). The question was:

“What is your goal for this course and how do you plan to achieve it?”

First, the student's goal response (GV1) was analyzed and rated as follows:

For remedial students, the following coding scheme was used:

0= blank or vague words "to listen," "to understand"
1= "to pass," or vague words: "do well," “do my best"
2= A, B, "good grade" or do well in next course (mastery goal)

For non-remedial students, goal response was rated:

0= “C" or "to pass"
1= "B," "at least B," or vague words: "do well," "good grade," “do my best"
2= "A" (only) or do well in next course (mastery goal)

Then the following strategies listed for achieving the goal were dichotomously scored:

A= "Attendance," "come to class"
L= "Listening" "pay attention," "ask questions"
S= "Studying" "work (hard)," "learn" *note: can be vague
SH= "doing Homework," "practice"
ST= "studying for Tests/Exams," "test preparation," "review," "do practice tests"
MT= "Managing Time," mention word "time"
T= "get Tutor," friends, relatives, or group help

If the student listed the above strategy, the strategy was coded 1, otherwise 0. Then a total count of strategies listed was summed (SC).

Finally, an overall goal setting score (GS) was obtained by using the following:

Goal Score= GV1+ count of strategies (max 2) where A & L count the same (+1)

The above formula created a scale ranging from 0 to 4 points for the student's overall goal setting score (GS).

Time Management Schedule

Student responses to a Time Management Schedule (Appendix B) were rated. Surveys with a similar component were used by Britton and Tesser (1991), Chu and Choi (2005), Macan et al. (1990), and Marlowe et al. (2002). Time planning was suggested by

Arem (2003), Bittinger (2003), McEwan (2000), and Pintrich (1995). The Time Management Schedule called for students to specify **"Days and Times when you will do your math homework."**

Three components of the responses were analyzed and rated: hours, days, and times. First, the total hours planned (TP) was totaled. A count of days (1 hour for each day) was used for missing hours unless information indicated otherwise. Then the total hours planned were recoded and another variable was created (TCE) so comparison to the actual hours spent (from the end of the semester survey) could be made. The new coding scheme was:

0= (A) 0-5 1= (B) 6-8 2= (C) 9-11 3= (D) 12-14 4= (E) >15 hours per week

Days (tDs) and times (tTs) specified were dichotomously coded specific = 1, not specific = 0. Then the total number of days was counted (TD).

Finally, a 5-point scale was created, ranging from 0 to 4 points, to rate the student's overall time management schedule. The student's time management score (ts) began at zero. Then points were awarded based upon the student's responses as follows:

0 (no points for 0-5.5 homework hours planned)
0 (no points for both days and times not stated)
+1 point (for 6-8.5 homework hours planned)
+2 points (for greater than 8.5 homework hours planned)
+1 point (for specific days stated)
+1 point (for specific times stated)

The points were totaled (maximum was 4) and an overall time management score (TS) was recorded.

<u>End of the Semester Survey</u>

Students reflected and answered questions regarding their usage of time in The End of Semester Survey (Appendix C). Each question used 5-point ordinal scale with choice “A)” accounting for the lowest number of units (exams, hours, and rating) coded as “0” and choice “E)” being the highest coded as “4.” Similar questions can be found in surveys used by Bradley (2006), Britton and Tesser (1991), Chu and Choi (2005), Cooper et al. (1998), Kim & Placier (2004), Macan et al. (1990), Marlowe et al. (2002), NEDRC (2000), and Soltz (1992).

Analysis

Descriptive statistics, frequency distributions, correlation matrices, t-tests, linear multiple regressions, and logistic regressions were used to answer the research questions. The data will be imported from an Excel spreadsheet into SPSS. Both Excel and SPSS will be used to generate statistics and analyses. In choosing a selection procedure, Pedhazur (1997, p. 212) noted the number of all possible regression equations with k predictors to be 2^k, so the predictors used in this study would yield an exorbitant amount of equations. However, there is no theoretical basis for choosing a prediction-selection procedure (Pedhazur, 1997, p. 211) so just a standard multiple regression (Mertler & Vannatta, 2005, p. 70) was used.

CHAPTER IV: RESULTS

"If you would not be forgotten as soon as you are dead and rotten, either write something worth reading or do things worth the writing."
-Benjamin Franklin (from Moncur, 1994)

The intention of this study was to determine the extent to which self-regulatory constructs are associated with mathematics achievement. During Fall 2005 to Spring 2006, three surveys from 8 math classes generated data (responses to a goal setting question, time management schedule, and end of semester reflection questions) on community college students' goal strategies, time management planning, and time usage. Courses categorized into 2 groups: remedial (3 "Elementary Algebra" classes) and non-remedial (1 "Intermediate Algebra," 1 "Linear Math," 1 "Data Analysis," 1 "Statistics for Science," and 1 "Probability" class). There were 40 remedial goal/time management surveys, 31 remedial "end of semester" surveys, 117 non-remedial goal/time management surveys, and 106 non-remedial "end of semester" surveys examined. The data came only from students who at least persisted to the first exam. The surveys were due on the first exam day, thus there were no data on students who withdrew before the first exam. Student's responses to a goal strategy question and time management schedule were rated using a coding scheme. The end of the semester survey questions had a 5-point multiple-choice scale. Results and discussion of the analyses in regard to each research question will be presented.

Students' responses to the goal question and time management survey were vague and ambiguous at times. Because of the subjective nature of the rating of students' responses, inter-rater reliability was calculated for each variable in the goal setting survey and time management schedule. A sample (n = 25) of surveys were chosen at random and rated by a Psychologist in the Counseling department at the institution of the study. Students' names and identification numbers were concealed to keep the identity of the students confidential. Percent agreement for each of the variables was found to be: course goal response 88%, attendance 100%, listening 92%, studying 68%, doing homework 100%, test prep 100%, managing time 96%, tutoring 100%, count of goal strategies 60%, overall goal setting score 56%, total hours planned 84%, hours planned coded same as end of semester survey 84%, days specific 100%, total days 88%, times specific 100%, and overall time management score 80%. Inter-rater reliability for the whole goal survey was 86% and 87% for the whole time management survey. Rating the responses for "studying," the count of total goal achieving strategies, and overall goal setting score is of concern. Although, inter-rater reliability was not good for some of the variables, ratings of most responses in disagreement were not too dissimilar.

The first set of analyses dealt with the remedial group.

<u>Research Question #1: What relationships exist between goal setting, time planning, time usage and remedial mathematics final average?</u>

A Spearman's rho correlation matrix (Table 1) and descriptive statistics (Table 2) were calculated for all variables in the three surveys given to remedial algebra students. Analysis of scatterplots did not reveal any outliers or influential points. Because of the ordinal nature of the variables, a Spearman's rho correlation coefficient was chosen over a Pearson. The relationships between course goal (GV1), individual goal strategies (attendance (A), listening (L), studying (S), homework (SH), test prep (ST), time management (MT), tutoring (T)), number of goal strategies (SC), overall goal setting score (GS), time planned (hours (TP), days (TDS, TD), times (TTS)), overall time management score (TS), number of exams desired (E), job hours (J), math homework hours (H), other class homework hours (O), course difficulty rating (D) and remedial algebra students' final average were calculated. Only the following variables had significant positive correlations with final average of students who persisted (FAP): homework as a goal strategy (SH, rho(25) = .42, $p < .05$), count of goal strategies (SC, rho(25) = .40, $p < .05$), and overall goal setting score (GS, rho(25) = .40, $p < .05$). None of the time management variables were correlated with final average.

Course difficulty rating (D) had a moderate negative correlation and the highest correlation of all the variables with final average (rho(29) = -.65, $p < .01$). This indicated that students who had higher final averages rated the course easier. With respect to course difficulty rating, remedial students who suggested doing homework as a goal strategy (SH), those with more goal strategies (SC), higher goal setting scores (GS), and those who specified days in their time management schedule (TDS) also rated the course more easy. Other significant correlations will be discussed with respect to the other research questions.

TABLE 1

SPEARMAN'S RHO CORRELATION MATRIX FOR REMEDIAL ALGEBRA STUDENTS

Spearman's Rho		P	FAP	GV1	A	L	S	SH	ST	MT	T	SC	GS
P	Correlation Coefficient	1											
	Sig. (2-tailed)	.											
	N	58											
FAP	Correlation Coefficient	.	1										
	Sig. (2-tailed)	.	.										
	N	31	31										
GV1	Correlation Coefficient	0.04	0.23	1									
	Sig. (2-tailed)	0.8	0.24	.									
	N	40	27	40									
A	Correlation Coefficient	-0.19	0.2	0.14	1								
	Sig. (2-tailed)	0.25	0.31	0.4	.								
	N	40	27	40	40								
L	Correlation Coefficient	-0.05	0.04	0.06	0.69	1							
	Sig. (2-tailed)	0.74	0.86	0.73	0	.							
	N	40	27	40	40	40							
S	Correlation Coefficient	-0.01	0.26	0.41	0.13	0.13	1						
	Sig. (2-tailed)	0.93	0.19	0.01	0.43	0.43	.						
	N	40	27	40	40	40	40						
SH	Correlation Coefficient	-0.01	0.42	0.2	0.14	-0.04	-0.18	1					
	Sig. (2-tailed)	0.96	0.03	0.21	0.39	0.83	0.26	.					
	N	40	27	40	40	40	40	40					
ST	Correlation Coefficient	0.2	0.3	0.21	-0.14	-0.14	-0.22	0.68	1				
	Sig. (2-tailed)	0.22	0.12	0.19	0.38	0.38	0.17	0	.				
	N	40	27	40	40	40	40	40	40				
MT	Correlation Coefficient	-0.09	-0.08	-0.23	-0.11	-0.11	-0.18	-0.1	-0.07	1			
	Sig. (2-tailed)	0.6	0.71	0.16	0.48	0.48	0.27	0.55	0.69	.			
	N	40	27	40	40	40	40	40	40	40			
T	Correlation Coefficient	.	.	.	.	.	.	.	.	.	.		
	Sig. (2-tailed)	.	.	.	.	.	.	.	.	.	.		
	N	40	27	40	40	40	40	40	40	40	40		
SC	Correlation Coefficient	-0.1	0.4	0.35	0.67	0.61	0.43	0.45	0.32	0.02	.	1	
	Sig. (2-tailed)	0.55	0.04	0.03	0	0	0.01	0	0.04	0.9	.	.	
	N	40	27	40	40	40	40	40	40	40	40	40	
GS	Correlation Coefficient	-0.08	0.4	0.78	0.41	0.3	0.56	0.46	0.39	-0.12	.	0.82	1
	Sig. (2-tailed)	0.64	0.04	0	0.01	0.06	0	0	0.01	0.45	.	0	.
	N	40	27	40	40	40	40	40	40	40	40	40	40

TABLE 1 (CONTINUED)

SPEARMAN'S RHO CORRELATION MATRIX FOR REMEDIAL ALGEBRA STUDENTS

Spearman's Rho		P	FAP	GV1	A	L	S	SH	ST	MT	T	SC	GS
TP	Correlation Coefficient	-0.18	-0.04	-0.16	-0.1	0.02	-0.05	-0.08	-0.29	-0.06	.	-0.21	-0.26
	Sig. (2-tailed)	0.27	0.86	0.32	0.56	0.91	0.75	0.61	0.07	0.71	.	0.19	0.11
	N	40	27	40	40	40	40	40	40	40	40	40	40
TCE	Correlation Coefficient	-0.25	0.28	-0.01	-0.13	-0.03	0.03	-0	-0.22	0.06	.	-0.14	-0.11
	Sig. (2-tailed)	0.12	0.16	0.94	0.43	0.84	0.88	0.98	0.16	0.7	.	0.39	0.52
	N	40	27	40	40	40	40	40	40	40	40	40	40
TDS	Correlation Coefficient	0.31	0.12	0	0.04	0.21	0.04	-0.02	0.12	0.1	.	0.16	0.07
	Sig. (2-tailed)	0.05	0.56	0.98	0.83	0.19	0.82	0.9	0.46	0.55	.	0.34	0.67
	N	40	27	40	40	40	40	40	40	40	40	40	40
TD	Correlation Coefficient	-0.09	0.09	0	-0.12	-0.07	0.01	0.02	-0.15	-0.09	.	-0.12	-0.11
	Sig. (2-tailed)	0.58	0.67	0.98	0.44	0.69	0.94	0.89	0.37	0.59	.	0.46	0.51
	N	40	27	40	40	40	40	40	40	40	40	40	40
TTS	Correlation Coefficient	-0.02	-0.14	0.04	-0.03	0.23	0.12	-0.16	-0.3	-0.01	.	-0.07	-0.03
	Sig. (2-tailed)	0.91	0.49	0.8	0.88	0.16	0.47	0.32	0.06	0.94	.	0.66	0.85
	N	40	27	40	40	40	40	40	40	40	40	40	40
TS	Correlation Coefficient	-0.07	0.09	0.02	-0.07	0.16	0.08	-0.1	-0.25	0.06	.	-0.08	-0.06
	Sig. (2-tailed)	0.68	0.67	0.89	0.68	0.33	0.61	0.54	0.11	0.71	.	0.64	0.71
	N	40	27	40	40	40	40	40	40	40	40	40	40
E	Correlation Coefficient	.	0.09	-0.02	-0.45	-0.35	0.23	-0.12	-0.03	0.12	.	-0.14	-0.02
	Sig. (2-tailed)	.	0.63	0.9	0.02	0.07	0.25	0.56	0.87	0.54	.	0.5	0.92
	N	31	31	27	27	27	27	27	27	27	27	27	27
J	Correlation Coefficient	.	0.07	0.28	0.04	-0.11	0.55	-0.12	-0.11	0.19	.	0.26	0.32
	Sig. (2-tailed)	.	0.71	0.15	0.83	0.58	0	0.55	0.6	0.35	.	0.19	0.1
	N	31	31	27	27	27	27	27	27	27	27	27	27
H	Correlation Coefficient	.	-0.26	-0.08	-0.17	-0.07	-0.04	-0.36	-0.31	-0.17	.	-0.35	-0.27
	Sig. (2-tailed)	.	0.16	0.69	0.38	0.73	0.83	0.06	0.12	0.39	.	0.08	0.18
	N	31	31	27	27	27	27	27	27	27	27	27	27
O	Correlation Coefficient	.	-0.06	0.04	-0.15	-0.21	-0.14	0.32	0.24	-0.16	.	-0.12	-0
	Sig. (2-tailed)	.	0.74	0.83	0.47	0.29	0.5	0.1	0.22	0.43	.	0.57	0.99
	N	31	31	27	27	27	27	27	27	27	27	27	27
D	Correlation Coefficient	.	-0.65	-0.22	-0.23	-0.12	-0.2	-0.42	-0.36	-0.2	.	-0.53	-0.46
	Sig. (2-tailed)	.	0	0.27	0.25	0.53	0.31	0.03	0.06	0.32	.	0	0.02
	N	31	31	27	27	27	27	27	27	27	27	27	27

TABLE 1 (CONTINUED)

SPEARMAN'S RHO CORRELATION MATRIX FOR REMEDIAL ALGEBRA STUDENTS

Spearman's Rho		TP	TCE	TDS	TD	TTS	TS	E	J	H	O	D
TP	Correlation Coefficient	1										
	Sig. (2-tailed)	.										
	N	40										
TCE	Correlation Coefficient	0.87	1									
	Sig. (2-tailed)	0	.									
	N	40	40									
TDS	Correlation Coefficient	0.02	0.04	1								
	Sig. (2-tailed)	0.93	0.78	.								
	N	40	40	40								
TD	Correlation Coefficient	0.69	0.64	-0.24	1							
	Sig. (2-tailed)	0	0	0.14	.							
	N	40	40	40	40							
TTS	Correlation Coefficient	0.42	0.39	0.44	0.08	1						
	Sig. (2-tailed)	0.01	0.01	0	0.64	.						
	N	40	40	40	40	40						
TS	Correlation Coefficient	0.71	0.78	0.5	0.35	0.83	1					
	Sig. (2-tailed)	0	0	0	0.03	0	.					
	N	40	40	40	40	40	40					
E	Correlation Coefficient	-0.16	0.06	0.34	-0.07	-0.16	0.03	1				
	Sig. (2-tailed)	0.42	0.78	0.09	0.71	0.42	0.89	.				
	N	27	27	27	27	27	27	31				
J	Correlation Coefficient	-0.09	0.03	0.35	0.04	-0.09	0.05	0.12	1			
	Sig. (2-tailed)	0.66	0.87	0.07	0.83	0.65	0.8	0.53	.			
	N	27	27	27	27	27	27	31	31			
H	Correlation Coefficient	0.39	0.31	-0.39	0.34	0.37	0.29	-0.22	-0.12	1		
	Sig. (2-tailed)	0.04	0.11	0.04	0.08	0.06	0.15	0.23	0.53	.		
	N	27	27	27	27	27	27	31	31	31		
O	Correlation Coefficient	0.13	0.15	-0.03	0.05	0.18	0.15	-0.04	-0.21	0.18	1	
	Sig. (2-tailed)	0.53	0.46	0.88	0.82	0.38	0.45	0.84	0.26	0.34	.	
	N	27	27	27	27	27	27	31	31	31	31	
D	Correlation Coefficient	0.06	-0.27	-0.39	0.07	0.06	-0.21	-0.04	-0.07	0.33	-0.03	1
	Sig. (2-tailed)	0.77	0.18	0.04	0.74	0.75	0.28	0.83	0.71	0.07	0.86	.
	N	27	27	27	27	27	27	31	31	31	31	31

TABLE 2

DESCRIPTIVE STATISTICS FOR REMEDIAL ALGEBRA STUDENTS' RESPONSES TO SURVEYS

	Variable	Mean	Standard Deviation	Sample Size
Achievement:				
Persistence	P	.53	.50	58
Final Average of Persisted	FAP	65.40	13.26	31
Goal Question Survey:				
Course Goal	GV1	1.18	.68	40
Attendance Strategy	A	.20	.41	40
Listening Strategy	L	.20	.41	40
Studying Strategy	S	.38	.49	40
Homework Strategy	SH	.15	.36	40
Test Prep Strategy	ST	.075	.27	40
Managing Time Strategy	MT	.05	.22	40
Tutoring Strategy	T	.00	.00	40
# of Strategies Listed	SC	1.05	1.01	40
Overall Goal Setting Score	GS	2.05	1.18	40
Time Management Schedule Survey:				
Homework Time Hours Planned	TP	5.81	3.47	40
Homework Time Hours Planned (coded same as ESS scale)	TCE	.73	1.04	40
Days Specific	TDS	.85	.36	40
# of Days specified	TD	3.58	1.39	40
Times Specific	TTS	.53	.51	40
Overall Time Management Score	TS	2.00	1.28	40
End of Semester Survey:				
# Exams desired	E	2.52	.89	31
Job Hours per Week	J	2.77	1.43	31
Algebra Homework Hours per Week	H	.58	.67	31
Other Class Homework Hours per Week	O	.61	.80	31
Course Difficulty Rating	D	2.61	.72	31

Research Question #2: What course goals and achievement strategies do remedial math students plan?

In response to the survey question "What is your goal for the course and how do you plan to achieve it," 85% of remedial students stated "to pass" or better (Table 3). However, overall goal setting score (GS, a measure to rate overall course goal with strategies, Table 4) was found to not differ from a uniform distribution among ratings from 0 to 4 ($X^2(4) = 7.000$, $p > .05$). Overall goal setting score (GS) correlated moderately with math achievement (FAP) as the better the goal setting the higher the final average.

TABLE 3

FREQUENCY DISTRIBUTION OF REMEDIAL ALGEBRA STUDENTS' COURSE GOALS (GV1)

Goal	f	%
0	6	15.0
1	21	52.5
2	13	32.5
Total	40	100

TABLE 4

FREQUENCY DISTRIBUTION OF REMEDIAL ALGEBRA STUDENTS' OVERALL GOAL SETTING SCORES (GS)

Score	f	%
0	4	10.0
1	10	25.0
2	10	25.0
3	12	30.0
4	4	10.0
Total	40	100.0

Table 5 presents a frequency distribution of strategies that students listed for achieving their course goal. The goal strategy with the highest frequency was "studying" (38%). Other words such as "work hard," "read," or "memorize" were included in this category. Studying (S) also correlated moderately with student's course goal (GV1, rho(38) = .41, $p < .01$). The higher the course goal, the more often the student responded with some implication of the word "studying."

TABLE 5

FREQUENCY DISTRIBUTION OF THE STRATEGIES REMEDIAL ALGEBRA STUDENTS LISTED FOR ACHIEVING THEIR COURSE GOAL

	Attendance	Listening	Studying	Homework	Test Prep	Manage Time	Tutor
f	8	8	15	6	3	2	0
%	20	20	37.5	15	7.5	5	0

"Attendance" and "Listening" had the second highest frequency (20% for both). Although "attendance" and "listening" had the same frequencies, the same students did not list both of these simultaneously. Some students listed "attendance" but not "listening." Others listed "listening" but not "attendance." Notwithstanding, there was a strong correlation (rho(38) = .69, $p < .01$) between the responses "attendance" (A) and "listening" (L). The category of "listening" also included phrases "pay attention" and "ask questions."

"Homework" and "Test Prep" followed (15% and 8%, respectively). There was a strong correlation between listing "homework" (SH) and "test prep" (ST, rho(38) = .68, $p < .01$). "Practice" was included in the "homework" category while "doing practice tests" was included in the "test prep" category. Listing "homework" as a goal strategy significantly correlated with algebra student's final average (FAP, rho(25) = .42, $p < .05$). The remedial algebra students who listed "homework" for achieving their goal did better in the course.

Remedial students listed on average 1 goal strategy (Table 2, mean = 1.05) but the highest frequencies were one and no strategies listed (Table 6, both 35%). The maximum number of goal strategies mentioned was 4. The more goal strategies (SC) listed the higher the final average (FAP, rho(25) = .4, $p < .05$).

Only 2 out of 40 students suggested managing their time as a strategy. No students mentioned tutoring.

TABLE 6

FREQUENCY DISTRIBUTION OF THE NUMBER OF REMEDIAL ALGEBRA GOAL ACHIEVING STRATEGIES LISTED (SC)

Strategies	f	%
0	14	35.0
1	14	35.0
2	9	22.5
3	2	5.0
4	1	2.5
Total	40	100.0

Research Question #3: What are the characteristics of students' planned time management schedules in remedial math courses?

Descriptive statistics (Table 2) and frequency distributions (Table 7) were analyzed for various characteristics of remedial algebra students' time management schedules. The average amount of time remedial students planned to do algebra homework at the beginning of the semester (TP) estimated to be about 5.81 hours per week (max = 14 hrs/wk, min = 1 hr/wk). Most students fell into the 0-6 hrs/wk category (Table 7, 60%). Students planned to do homework on an average of 3.6 different days per week (TD). Every student who turned in a survey made reference to at least 1 day, although not all students were very specific about the days (i.e. "every day," "weekends," or "x days"). More so, 85% of the students specified the actual days (TDS) while only 53% specified the times (TTS). There was a strong positive correlation between the number of hours listed (TP) and the number of days (TD, $rho(38) = .69$, $p < .01$). This would seem to make sense as the more hours students have planned, the more days needed for those hours. Although some students listed days without times and vice versa, there was still a moderate positive correlation between times (TTS) and days specified (TDS, rho(38) = .44, $p < .01$). No significant correlations were found between any of the goal setting characteristics and time management schedules. Furthermore, time management score (TS, a measure to rate the overall time management schedule for hours, days, and times) did not significantly correlate with math achievement.

TABLE 7

FREQUENCY DISTRIBUTIONS OF REMEDIAL ALGEBRA STUDENTS' TIME MANAGEMENT SCHEDULES

	f	%
Time Planned in Hours Per Week (TCE)		
0-6	24	60
6-9	7	17.5
9-12	5	12.5
12-15	4	10
>15	0	0
Total	40	100
Days Specific (TDS)		
No	6	15
Yes	34	85
Total	40	100
Number of Days Per Week (TD)		
0	0	0
1	2	5
2	4	10
3	17	42.5
4	9	22.5
5	5	12.5
6	0	0
7	3	7.5
Total	40	100

TABLE 7 (CONTINUED)

	f	%
Times Specific (TTS)		
No	19	47.5
Yes	21	52.5
Total	40	100
Overall Time Management Score (TS)		
0	4	10
1	12	30
2	12	30
3	4	10
4	8	20
Total	40	100

Research Question #4: What are the characteristics of students' time usage and reflections in remedial math courses?

Descriptive statistics (Table 8) and frequency distributions (Table 9) were found for remedial algebra students' responses to the "End of Semester" survey.

TABLE 8

DESCRIPTIVE STATISTICS OF REMEDIAL ALGEBRA STUDENTS' RESPONSES TO "END OF SEMESTER" SURVEY

	Mean	Interpolation Interpretation for Mean	Standard Deviation	Sample Size
# of Exams desired	2.52	3-4	.89	31
Job hours worked	2.77	27.6[a]	1.43	31
Homework hours spent on Algebra Class	.58	5.1[b]	.67	31
Hours spent on Other Classes	.61	7.4[a]	.80	31
Course Difficulty rating	2.61	Average-Hard	.72	31

a. based on quadratic trend of choices ($y' = 0.3799x^2 + 8.0467x + 2.3051$, $R^2 = 0.9675$)
b. based on quadratic trend of choices ($y' = -0.0797x^2 + 4.0446x + 2.7854$, $R^2 = 0.9549$)

TABLE 9

FREQUENCY DISTRIBUTIONS OF REMEDIAL ALGEBRA STUDENTS' RESPONSES TO "END OF SEMESTER" SURVEY QUESTIONS

	f	%
NUMBERS OF EXAMS DESIRED (E)		
1	1	3.2
2	3	9.7
3	8	25.8
4	17	54.8
>4	2	6.5
Total	31	100
Job Hours Per Week Worked (J)		
0-6	4	12.9
6-15	2	6.5
15-25	5	16.1
25-35	6	19.4
>35	14	45.2
Total	31	100
0-6	16	51.6
6-9	12	38.7
9-12	3	9.7
12-15	0	0
>15	0	0
Total	31	100
0-6	17	54.8
6-15	10	32.3
15-25	3	9.7
25-35	1	3.2
>35	0	0
Total	31	100

TABLE 9 (CONTINUED)

	f	%
Course Difficulty Rating (D)		
Very Easy	0	0
Easy	1	3.2
Average	13	41.9
Hard	14	45.2
Very Hard	3	9.7
Total	31	100

On average, students thought 3-4 exams would be about right; and the majority desired 4 exams (55%). The only other variable that amount of exams (E) correlated significantly with was the "attendance" (A) goal strategy. Those that reported "attendance" (A) as a goal achieving strategy at the beginning of the semester wanted less exams (E) by the end of the semester ($rho(25) = -.45$, $p < .05$).

Remedial algebra students worked approximately 28 hours per week (Table 8, mean = 2.77 interpreted by using an interpolation procedure which yielded a quadratic trend of the coded choices) and 45% worked more than 35 hours per week. Eighty-one percent worked more than 15 hours per week. Students that responded with "studying" (S) as a goal strategy worked more job hours (J, $rho(24) = .55$, $p < .01$). Job hours did not correlate significantly with any other variables.

Remedial algebra students reported spending about 5 hours per week on their algebra homework (mean = .58 interpreted from the quadratic trend of coded choices) and the majority (52%) spent 0-6 hours per week. Not one student reported spending more than 12 hours per week on algebra homework. Remedial algebra homework time (H) did not significantly correlate with job hours or final average.

An average of 7.4 hours per week (mean = .61 interpreted by quadratic interpolation) was spent studying for other classes and the majority of students (55%) spent 0-6 hours per week studying. No remedial students reported spending more than 35 hours on other class homework and only 1 student reported spending 25-35 hours per week. Other class homework time (O) did not significantly correlate with algebra homework time, job hours, or final average.

The mean course difficulty rating for three remedial "Elementary Algebra" classes was "Average" to "Hard" where 42% rated the class as "Average" and 45% rated the class as "Hard." Not one remedial algebra student rated the class "Very Easy." Course difficulty (D) rating correlated significantly with five variables. An easier rating was reported in the classes when students: mentioned "homework" as a goal strategy (H), had more goal strategies (SC), had higher goal setting scores (GS), specified days (TDS) in their time management schedules, and had higher final averages (FAP).

Research Question #5: Does there exist a significant difference between remedial math students' time planned (at the beginning of the semester) and the actual time spent (noted at the end of the semester)?

The hours from the time planned at the beginning of the semester (TP) were recoded so they could be compared to the actual time spent noted at the end of the semester. The new code, TCE, used the same coding scheme as study time for algebra class (H) reported on the end of the semester survey. The mean algebra homework time planned at the beginning of the semester was .73 (sd = 1.04) and the mean time actually spent was .58 (sd = .67). Since n = 27 (< 30) and tests of normality (Table 10) indicated the distribution of data differed significantly from a normal distribution, a Nonparametric test was used. The Wilcoxon Signed-Ranks test (Table 11) for matched pairs examined the results of the time planned at the beginning of semester (TCE) and hours actually spent (H) for remedial algebra students that persisted to the final exam. No significant difference was found in the results (Z= -.037, $p > .05$). Time planned at the beginning of semester was not significantly different from hours actually spent. Remedial algebra students that persisted seemed to keep their word on how much time they planned for doing math homework.

TABLE 10

TESTS OF NORMALITY FOR TIME PLANNED (TCE) AND TIME ACTUALLY SPENT (H) FOR REMEDIAL ALGEBRA STUDENTS

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
TCE	.358	40	.000	.702	40	.010**
H	.322	31	.000	.743	31	.010**

** This is an upper bound of the true significance.
a. Lilliefors Significance Correction

TABLE 11

WILCOXON SIGNED RANKS TEST FOR DIFFERENCE IN REMEDIAL ALGEBRA STUDENTS' TIME PLANNED AT THE BEGINNING OF THE SEMESTER AND THE ACTUAL TIME SPENT

Ranks

		N	Mean Rank	Sum of Ranks
H - TCE	Negative Ranks	6[a]	7.67	46.00
	Positive Ranks	7[b]	6.43	45.00
	Ties	14[c]		
	Total	27		

a. H < TCE
b. H > TCE
c. TCE = H

TABLE 11 (CONTINUED)

Test Statistics

	H - TCE
Z	-.037
Asymp. Sig. (2-tailed)	.971

a. Based on positive ranks.
b. Wilcoxon Signed Ranks Test

Research Question #6: To what extent do goal setting, time planning, and time usage predict remedial math students' final average?

Standard multiple regression was conducted to estimate the strength of the relationships of the independent variables (overall goal setting score (GS), overall time management score (TS), number of exams desired (E), job hours (J), algebra homework time (H), other class homework time (O), and course difficulty rating (D)) with remedial algebra students' final average (FAP). A preliminary examination of the correlation matrix for multicollinearity did not reveal any strong correlations among the predictor variables and all tolerance measures were above .1. Regression results (Table 12) indicated that the overall model did not significantly predict remedial math final average (R^2 = .396, R^2_{adj} = .173, F(7,19) = 1.779, p > .05). Significance was hard to uncover since there were a large number of independent variables relative to a small sample size.

TABLE 12

MODEL SUMMARY OF MULTIPLE REGRESSION TO PREDICT REMEDIAL ALGEBRA STUDENTS' FINAL AVERAGE

Model Summary[b]

	R	R Square	Adjusted R Square	Std. Error of the Estimate			
Model					df1	df2	Sig. F Change
1	.629[a]	.396	.173	12.0567	7	19	.150

a. Predictors: (Constant), D, O, E, J, TS, H, GS
b. Dependent Variable: FAP

Research Question #7: What relationships exist between goal setting, time planning, and remedial math course persistence?

Of 58 total "Elementary Algebra" students who started the courses, 47% withdrew by the end of the semester. Of 40 that persisted to the first exam, 31 persisted to the final (23% attrition for the study). A Spearman's rho correlation matrix (Table 2) was calculated for the relationships between course goal (GV1), individual goal strategies (attendance (A), listening (L), studying (S), homework (SH), test prep (ST), time management (MT), tutoring (T)), number of goal strategies (SC), overall goal setting score (GS), time planned (hours (TP), days (TDS, TD), times (TTS)), overall time management score (TS), and persistence (P, coded 1 if persisted to the final exam, coded 0 if withdrew from course). None of the variables significantly correlated with persistence. It should be noted data were only collected on students who persisted to the first exam. This study does not include information for students who withdrew before the first exam. It would be interesting to find out if students who persisted to the first exam had better goal setting and time management than those who did not.

Research Question #8: To what extent do goal setting and time planning predict which remedial math students persist and which withdraw?

Logistic regression was conducted to determine if remedial algebra students' overall goal setting score and overall time management score were predictors of persistence. Regression results (Table 13) indicated the overall model was not statistically reliable in distinguishing who persisted and who withdrew (-2 Log Likelihood = 49.977; $X^2(2)= .470$, $p > .05$). The model correctly classified 67.5% of the cases. Wald statistics indicated that neither of the variables predicted persistence. Odds ratios for these variables indicated little change in the likelihood of persistence.

TABLE 13

MODEL SUMMARY OF LOGISTIC REGRESSION TO PREDICT REMEDIAL ALGEBRA STUDENTS' PERSISTENCE

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	.470	2	.791
	Block	.470	2	.791
	Model	.470	2	.791

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	49.977[a]	.012	.016

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1	gs	-.126	.294	.185	1	.667	.881
	ts	-.150	.268	.314	1	.575	.861
	Constant	1.300	.927	1.964	1	.161	3.668

The second set of analyses presented concerned the students who were in the non-remedial classes. For purposes of analysis, they are combined into a single group here. This group is used to address research questions 9 to 16.

Research Question #9: What relationships exist between goal setting, time planning, time usage and non-remedial mathematics final average?

A Spearman's rho correlation matrix (Table 14) and descriptive statistics (Table 15) were calculated for the relationships between all variables in the three surveys given to non-remedial math students. Analysis of scatterplots did not reveal any outliers or influential points. Many significant correlations were found. The results are highlighted relative to each survey. Comparisons of non-remedial versus remedial math students are also made.

TABLE 14

SPEARMAN'S RHO CORRELATION MATRIX FOR NON-REMEDIAL MATH STUDENTS

Spearman's Rho		P	FAP	GV1	A	L	S	SH	ST	MT	T	SC	GS
P	Correlation Coefficient	1											
	Sig. (2-tailed)	.											
	N	139											
FAP	Correlation Coefficient	.	1										
	Sig. (2-tailed)	.	.										
	N	106	106										
GV1	Correlation Coefficient	0.18	0.27	1									
	Sig. (2-tailed)	0.05	0	.									
	N	117	105	117									
A	Correlation Coefficient	-0.05	-0.01	-0.1	1								
	Sig. (2-tailed)	0.6	0.92	0.28	.								
	N	117	105	117	117								
L	Correlation Coefficient	-0.12	-0.05	-0.05	0.26	1							
	Sig. (2-tailed)	0.19	0.6	0.58	0	.							
	N	117	105	117	117	117							
S	Correlation Coefficient	-0.04	0.06	0.05	-0.01	0.16	1						
	Sig. (2-tailed)	0.7	0.57	0.6	0.88	0.09	.						
	N	117	105	117	117	117	117						
SH	Correlation Coefficient	0.02	0.1	0.18	0.12	0.05	-0.19	1					
	Sig. (2-tailed)	0.85	0.33	0.05	0.2	0.58	0.04	.					
	N	117	105	117	117	117	117	117					
ST	Correlation Coefficient	-0.1	0.14	0.1	-0.07	0.07	-0.2	0.29	1				
	Sig. (2-tailed)	0.29	0.15	0.27	0.45	0.48	0.03	0	.				
	N	117	105	117	117	117	117	117	117				
MT	Correlation Coefficient	0.03	0.07	0.08	-0.08	-0.05	-0.16	0.03	-0.11	1			
	Sig. (2-tailed)	0.75	0.45	0.41	0.38	0.56	0.09	0.77	0.25	.			
	N	117	105	117	117	117	117	117	117	117			
T	Correlation Coefficient	0.07	-0.04	0.02	-0.05	-0.08	-0.05	-0.13	-0.06	-0.07	1		
	Sig. (2-tailed)	0.44	0.66	0.84	0.6	0.39	0.56	0.16	0.49	0.42	.		
	N	117	105	117	117	117	117	117	117	117	117		
SC	Correlation Coefficient	-0	0.12	0.18	0.27	0.51	0.41	0.51	0.31	0.21	0.06	1	
	Sig. (2-tailed)	0.97	0.23	0.06	0	0	0	0	0	0.02	0.49	.	
	N	118	105	117	117	117	117	117	117	117	117	117	
GS	Correlation Coefficient	0.12	0.23	0.78	0.05	0.27	0.29	0.43	0.26	0.19	0.06	0.73	1
	Sig. (2-tailed)	0.19	0.02	0	0.59	0	0	0	0	0.05	0.5	0	.
	N	117	105	117	117	117	117	117	117	117	117	117	117

TABLE 14 (CONTINUED)

SPEARMAN'S RHO CORRELATION MATRIX FOR NON-REMEDIAL MATH STUDENTS

Spearman's Rho		P	FAP	GV1	A	L	S	SH	ST	MT	T	SC	GS
TP	Correlation Coefficient	0.09	0.32	0.05	0.04	-0.22	-0.02	-0.14	0.15	0.09	0.07	-0.05	0
	Sig. (2-tailed)	0.34	0	0.57	0.68	0.02	0.8	0.13	0.11	0.31	0.45	0.6	0.97
	N	116	104	116	116	116	116	116	116	116	116	116	116
TCE	Correlation Coefficient	0.03	0.32	0.07	0.04	-0.19	-0.03	-0.07	0.2	0.11	0.04	0.02	0.05
	Sig. (2-tailed)	0.74	0	0.46	0.67	0.05	0.77	0.47	0.03	0.25	0.71	0.87	0.62
	N	116	104	116	116	116	116	116	116	116	116	116	116
TDS	Correlation Coefficient	0.19	0.21	0.11	0.09	-0.07	-0.03	-0.09	0.03	-0.1	0.08	-0.05	0.04
	Sig. (2-tailed)	0.04	0.03	0.26	0.32	0.45	0.78	0.33	0.73	0.3	0.37	0.61	0.65
	N	117	105	117	117	117	117	117	117	117	117	117	117
TD	Correlation Coefficient	0.05	0.16	0.07	-0.02	-0.15	-0.13	-0.02	0.05	0.13	0.07	-0.02	0.06
	Sig. (2-tailed)	0.6	0.09	0.44	0.87	0.1	0.16	0.87	0.59	0.17	0.47	0.8	0.53
	N	116	104	116	116	116	116	116	116	116	116	116	116
TTS	Correlation Coefficient	0.2	0.17	0.28	0.1	-0.07	0.08	0	0.11	-0.06	0.16	0.1	0.26
	Sig. (2-tailed)	0.03	0.08	0	0.28	0.44	0.38	0.99	0.23	0.5	0.08	0.27	0.01
	N	117	105	117	117	117	117	117	117	117	117	117	117
TS	Correlation Coefficient	0.12	0.34	0.18	0.07	-0.16	-0.03	-0.05	0.19	-0.02	0.09	0	0.12
	Sig. (2-tailed)	0.2	0	0.06	0.46	0.08	0.74	0.61	0.04	0.81	0.34	0.98	0.2
	N	117	105	117	117	117	117	117	117	117	117	117	117
E	Correlation Coefficient	.	-0.09	-0.12	0.1	-0.03	-0.3	-0.1	0.03	0.14	0.02	-0.13	-0.12
	Sig. (2-tailed)	.	0.37	0.22	0.31	0.76	0	0.29	0.78	0.15	0.82	0.19	0.21
	N	106	106	105	105	105	105	105	105	105	105	105	105
J	Correlation Coefficient	.	-0.17	0.02	-0.08	-0.04	0.06	-0.03	0.02	0.13	0.06	0.1	0.08
	Sig. (2-tailed)	.	0.08	0.81	0.43	0.66	0.53	0.78	0.86	0.19	0.56	0.31	0.43
	N	106	106	105	105	105	105	105	105	105	105	105	105
H	Correlation Coefficient	.	-0.07	-0.13	-0.13	0	-0.06	-0.2	-0.08	0.1	0.08	-0.17	-0.19
	Sig. (2-tailed)	.	0.46	0.18	0.2	0.97	0.54	0.04	0.45	0.31	0.41	0.08	0.05
	N	106	106	105	105	105	105	105	105	105	105	105	105
O	Correlation Coefficient	.	0.01	0	0.07	-0.23	-0.2	-0.07	0.04	0.06	0.04	-0.21	-0.12
	Sig. (2-tailed)	.	0.94	0.97	0.51	0.02	0.04	0.46	0.69	0.57	0.66	0.03	0.21
	N	106	106	105	105	105	105	105	105	105	105	105	105
D	Correlation Coefficient	.	-0.45	-0.3	0.02	0.16	0.06	-0.15	-0.13	0.01	0.06	-0.03	-0.19
	Sig. (2-tailed)	.	0	0	0.8	0.11	0.57	0.12	0.19	0.91	0.52	0.79	0.05
	N	106	106	105	105	105	105	105	105	105	105	105	105

TABLE 14 (CONTINUED)

SPEARMAN'S RHO CORRELATION MATRIX FOR NON-REMEDIAL MATH STUDENTS

Spearman's Rho		TP	TCE	TDS	TD	TTS	TS	E	J	H	O	D
TP	Correlation Coefficient	1										
	Sig. (2-tailed)	.										
	N	116										
TCE	Correlation Coefficient	0.92	1									
	Sig. (2-tailed)	0	.									
	N	116	116									
TDS	Correlation Coefficient	0.32	0.35	1								
	Sig. (2-tailed)	0	0	.								
	N	116	116	117								
TD	Correlation Coefficient	0.5	0.38	0.12	1							
	Sig. (2-tailed)	0	0	0.18	.							
	N	116	116	116	116							
TTS	Correlation Coefficient	0.54	0.57	0.51	0.14	1						
	Sig. (2-tailed)	0	0	0	0.12	.						
	N	116	116	117	116	117						
TS	Correlation Coefficient	0.83	0.91	0.6	0.33	0.81	1					
	Sig. (2-tailed)	0	0	0	0	0	.					
	N	116	116	117	116	117	117					
E	Correlation Coefficient	0.03	-0.03	-0.13	0.22	-0.03	-0.04	1				
	Sig. (2-tailed)	0.76	0.73	0.18	0.03	0.79	0.67	.				
	N	104	104	105	104	105	105	106				
J	Correlation Coefficient	-0.06	-0.12	-0.22	-0.1	-0.16	-0.18	0.05	1			
	Sig. (2-tailed)	0.54	0.21	0.03	0.29	0.1	0.07	0.64	.			
	N	104	104	105	104	105	105	106	106			
H	Correlation Coefficient	0.09	0.02	0.01	0.03	-0.11	-0.03	0.05	0	1		
	Sig. (2-tailed)	0.37	0.85	0.95	0.76	0.24	0.76	0.64	0.98	.		
	N	104	104	105	104	105	105	106	106	106		
O	Correlation Coefficient	-0.01	-0.06	0.02	0.04	-0.03	-0.04	0.17	-0.13	0.34	1	
	Sig. (2-tailed)	0.9	0.54	0.81	0.71	0.72	0.7	0.09	0.19	0	.	
	N	104	104	105	104	105	105	106	106	106	106	
D	Correlation Coefficient	-0.19	-0.14	-0.13	-0.07	-0.15	-0.19	0.05	0.01	0.2	-0.01	1
	Sig. (2-tailed)	0.06	0.16	0.2	0.47	0.13	0.05	0.61	0.9	0.04	0.92	.
	N	104	104	105	104	105	105	106	106	106	106	106

TABLE 15

DESCRIPTIVE STATISTICS FOR NON-REMEDIAL MATH STUDENTS' RESPONSES TO SURVEYS

	Variable	Mean	Standard Deviation	Sample Size
Achievement:				
Persistence	P	.76	.43	139
Final Average of Persisted	FAP	80.51	15.26	106
Goal Question Survey:				
Course Goal	GV1	1.15	.71	117
Attendance Strategy	A	.051	.22	117
Listening Strategy	L	.13	.34	117
Studying Strategy	S	.53	.50	117
Homework Strategy	SH	.27	.45	117
Test Prep Strategy	ST	.086	.28	117
Managing Time Strategy	MT	.11	.32	117
Tutoring Strategy	T	.047	.20	117
# of Strategies Listed	SC	1.22	.86	117
Overall Goal Setting Score	GS	2.27	1.10	117
Time Management Schedule Survey:				
Homework Time Hours Planned	TP	7.14	4.13	116
Homework Time Hours Planned (coded same as ESS scale)	TCE	1.06	1.16	116
Days Specific	TDS	.86	.35	117
# of Days specified	TD	3.64	1.50	116
Times Specific	TTS	.62	.49	117
Overall Time Management Score	TS	2.38	1.40	117
End of Semester Survey:				
# Exams desired	E	2.93	.62	106
Job Hours per Week	J	2.60	1.26	106
Math Homework Hours per Week	H	.75	1.01	106
Other Class Homework Hours per Week	O	.88	.91	106
Course Difficulty Rating	D	2.60	.82	106

For the goal setting question, only course goal (GV1) and overall goal setting score (GS) had significant correlations with final average (FAP, rho(103) = .27, $p < .01$; rho(103) = .23, $p < .05$, respectively). The overall goal setting score was a measure of the initial course goal combined with a count of strategies. Overall goal setting score was highly correlated with course goal (rho(115) = .78, $p < .01$) and count of strategies (SC, rho(115) = .73, $p < .01$). This could help explain why the overall goal setting score was significant even though the count of goal strategies and all of specific listed strategies were not individually significant.

With respect to time management, the following variables all had significant positive correlations with math final average (FAP): time planned (TP, rho(102) = .33, $p < .01$), days specified (TDS, rho(103) = .22, $p < .05$), and overall time management score (TS, rho(103) = .34, $p < .05$). Total days (TD) counted and times (TTS) specified did not significantly correlate with final average. Time planned and overall time management score (TS) had significant positive correlations with all time management variables. Days and times specified were significantly correlated (rho(115) = .51, $p < .01$) indicating that non-remedial students who generally listed the days also listed the times. However, since days specified significantly correlated with final average but times did not, this would mean that not all those who achieved better had their times figured out in the beginning of the semester.

The end of the semester survey only produced one variable that significantly correlated with math final average (FAP). As with remedial students, course difficulty rating (D) had the highest correlation with final average (rho(104) = -.45, $p < .01$) of any variable in the three surveys. Again the better the final average, the easier the students rated the course.

Research Question #10: What course goals and achievement strategies do non-remedial math students plan?

In response to the survey question "What is your goal for the course and how do you plan to achieve it," a course goal rating of "1" (Table 16, 48%) occurred most frequently. This meant that more students responded with "B," "at least B," or vague words such as "do well," "good grade," “do my best" than "C" or "A." Both course goal (GV1) and goal setting (GS) had significant positive correlations with final average (FAP). Like remedial algebra students, non-remedial math students who had better overall goal setting achieved a higher average in the course.

TABLE 16

FREQUENCY DISTRIBUTION OF NON-REMEDIAL MATH STUDENTS' COURSE GOALS (GV1)

Goal	f	%
0	22	18.8
1	56	47.9
2	39	33.3
Total	117	100

TABLE 17

FREQUENCY DISTRIBUTION OF NON-REMEDIAL MATH STUDENTS' OVERALL GOAL SETTING SCORES (GS)

Score	f	%
0	5	4.3
1	26	22.2
2	35	29.9
3	34	29.1
4	17	14.5
Total	117	100

Table 18 presents a frequency distribution of strategies that non-remedial math students listed for achieving their course goal. As with remedial algebra students, the goal strategy with the highest frequency (53%) was "studying." Less non-remedial math students mentioned "attendance" and "listening" as a goal strategy than remedial students;

but more non-remedial students listed "studying," "homework," "managing time," and "tutoring." "Studying," "homework," and "managing time" are much stronger self-regulatory strategies. This may indicate that non-remedial students may self-regulate better. The results of t-tests are presented later to see if any of these differences are significant. None of the individual non-remedial goal strategies produced a significant correlation with final average. Both non-remedial and remedial students listed "tutoring" the least. Mentioning "group work," "friends' help," or "relative's help" fell into the "tutoring" category.

TABLE 18

FREQUENCY DISTRIBUTION OF THE STRATEGIES NON-REMEDIAL MATH STUDENTS LISTED FOR ACHIEVING THEIR COURSE GOAL

	Attendance	Listening	Studying	Homework	Test Prep	Manage Time	Tutor
f	6	15	62	32	10	13	5
%	5.1	12.8	53	27.4	8.5	11.1	4.3

Half of all non-remedial students listed 1 goal achieving strategy (Table 19) and about a quarter listed 2 goal achieving strategies. Like remedial students, only a small percentage of non-remedial students listed more than 2 goal achieving strategies. However, non-remedial students listed 1 and 2 strategies more frequently than remedial students. The number of goal achieving strategies listed by remedial students correlated with final average but was not the same case for non-remedial students.

TABLE 19

FREQUENCY DISTRIBUTION OF THE NUMBER OF NON-REMEDIAL MATH GOAL ACHIEVING STRATEGIES LISTED (SC)

Strategies	f	%
0	21	17.9
1	58	49.6
2	32	27.4
3	3	2.6
4	3	2.6
Total	117	100

Research Question #11: What are the characteristics of students' planned time management schedules in non-remedial math courses?

Descriptive statistics (Table 15) and frequency distributions (Table 20) were found for various characteristics of non-remedial math students' time management schedules. The average amount of time non-remedial students planned to do math homework at the beginning of the semester (TP) estimated to be about 7.14 hours per week (max = 21 hrs/wk, min = 0 hr/wk). Like remedial algebra students, the highest frequency of students fell into the 0-6 hrs/wk planned category (Table 20, 41%). However, non-remedial students had higher frequencies in all the upper 4 time planned categories. Non-remedial math students planned to spend the same amount of days per week (3.6) doing their math homework as remedial students. The most frequent number of days planned by non-remedial math students was 4 days (28%) while the most frequent number of days planned by remedial students was 3 days (43%). Eighty-six percent of non-remedial math students specified the days and 62% specified the times. Like remedial algebra students, there was a moderate correlation between days (TDS) and times (TTS) specified by non-remedial students ($rho(115) = .51$, $p < .01$). However, unlike remedial algebra students, non-remedial overall time management score (TS) significantly correlated with final average (FAP, rho(103) = .34, $p < .05$). Average overall time management score was 2.38 but the highest frequency was a perfect score of 4 (31%).

TABLE 20

FREQUENCY DISTRIBUTIONS OF NON-REMEDIAL MATH STUDENTS' TIME MANAGEMENT SCHEDULES

	f	%
Time Planned in Hours Per Week (TCE)		
0-6	48	41.4
6-9	32	27.6
9-12	24	20.7
12-15	5	4.3
>15	7	6
Total	116	100
Days Specific (TDS)		
No	16	13.7
Yes	101	86.3
Total	117	100
Number of Days Per Week (TD)		
0	3	2.6
1	5	4.3
2	16	13.8
3	29	25
4	33	28.4
5	19	16.4
6	6	5.2
7	5	4.3
Total	116	100
Times Specific (TTS)		
No	44	37.6
Yes	73	62.4
Total	117	100
Overall Time Management Score (TS)		
0	14	12
1	22	18.8
2	22	18.8
3	23	19.7
4	36	30.8
Total	117	100

Research Question #12: What are the characteristics of students' time usage and reflections in non-remedial math courses?

Descriptive statistics (Table 21) and frequency distributions (Table 22) were calculated and constructed for non-remedial math students' responses to the "End of Semester" survey.

TABLE 21

DESCRIPTIVE STATISTICS OF NON-REMEDIAL MATH STUDENTS' RESPONSES TO "END OF SEMESTER" SURVEY

	Mean	Interpolation Interpretation for Mean	Standard Deviation	Sample Size
# of Exams desired	2.93	4	.62	106
Job hours worked	2.60	25.8[a]	1.26	106
Homework hours spent on Math Class	.75	5.8[b]	1.01	106
Hours spent on Other Classes	.88	9.7[a]	.91	106
Course Difficulty rating	2.60	Average-Hard	.82	106

a. based on quadratic trend of choices ($y' = 0.3799x^2 + 8.0467x + 2.3051$, $R^2 = 0.9675$)
b. based on quadratic trend of choices ($y' = -0.0797x^2 + 4.0446x + 2.7854$, $R^2 = 0.9549$)

TABLE 22

FREQUENCY DISTRIBUTIONS OF NON-REMEDIAL MATH STUDENTS' RESPONSES TO "END OF SEMESTER" SURVEY QUESTIONS

	f	%
Numbers of Exams Desired (E)		
1	0	0
2	3	2.8
3	15	14.2
4	74	69.8
>4	14	13.2
Total	106	100

TABLE 22 (CONTINUED)

	f	%
Job Hours Per Week Worked (J)		
0-6	12	11.3
6-15	4	3.8
15-25	29	27.4
25-35	30	28.3
>35	31	29.2
Total	106	100
0-6	57	53.8
6-9	28	26.4
9-12	14	13.2
12-15	4	3.8
>15	3	2.8
Total	106	100
0-6	41	38.7
6-15	45	42.5
15-25	14	13.2
25-35	4	3.8
>35	2	1.9
Total	106	100
Course Difficulty Rating (D)		
Very Easy	1	0.9
Easy	7	6.6
Average	38	35.8
Hard	47	44.3
Very Hard	13	12.3
Total	106	100

Similarly to remedial algebra students, the majority (70%) of non-remedial math students desired 4 exams (Table 22). Furthermore, not one non-remedial student reported desiring only 1 exam. A small frequency for desiring 1 exam was also found among remedial algebra students.

Non-remedial math students worked approximately 26 hours per week (mean =

2.60 interpreted by using an interpolation procedure which yielded a quadratic trend of the coded choices) and 29% worked more than 35 hours. Job time (Table 22) was somewhat evenly distributed among the categories "15-25," "25-35," and ">35" accounting for 85% of non-remedial math students working more than 15 hours per week. A similar result was found for remedial algebra students though they worked more frequently in the 35 or more hours per week category (45% versus 29%). Non-remedial job hours (J) did not correlate significantly with math final average (FAP) or any other variable but days specified. Days specified (TDS) in the time management schedule showed a low significant negative correlation with job time (rho(103) = -.22, $p < .05$). This could indicate that students who worked less job hours could more easily specify what days they wished to do their math homework.

Non-remedial math students reported spending about 6 hours per week on their math homework (Table 21, mean = .75 interpreted from the quadratic trend of coded choices) and the majority (54%) spent 0-6 hours per week (Table 22). A similar result was found among remedial algebra students except non-remedial students reported spending more time above 9 hours. Of non-remedial students, 6.6% spent over 12 hours per week doing their math homework, whereas, no remedial students reported spending over 12 hours. The only variable math homework time significantly correlated with was listing homework as a goal strategy (rho(103) = -.20, $p < .05$). Ironically, those that listed homework as a goal achieving strategy spent less time on homework.

Non-remedial math students spent about 10 hours per week (Table 21, interpreted from mean = .88 by using interpolation based on a quadratic trend of the coded choices) on other class homework. Similar to remedial algebra students, a small percentage of non-remedial math students spent more than 35 hours per week on other class homework (Table 22). However, unlike remedial students, the highest category was "6-15" hours per week (43%) whereas the majority of remedial students spent "0-6" hours per week (55%). Furthermore, unlike the remedial results, other homework time (O) did correlate significantly with math homework time (H, rho(104) = .34, $p < .01$). The more time non-remedial math students spent on math homework, the more time they spent on other class homework, too. Other class homework time did not correlate significantly with job hours or final average.

Like remedial algebra students, non-remedial students in 5 math classes typically rated the courses "Average" to "Hard" (Table 22). The highest frequency (44%) was "Hard" and like remedial courses almost nobody rated the course "Very Easy." Course difficulty rating (D) had a significant positive correlation with time spent on math homework (H, rho(104) = .20, $p < .05$) but significant negative correlations with course goal (GV1, rho(103) = -.30, $p < .01$ and final average (FAP, rho(104) = -.45, $p < .01$). The more time non-remedial students spent on math homework the harder the course was rated, but the higher the course goal and final average, the easier the math course was rated. Reasoning is that not everyone who reported more hours for studying math did well.

<u>Research Question #13: Does there exist a significant difference between non-remedial math students' time planned (at the beginning of the semester) and the actual time spent (noted at the end of the semester)?</u>

The hours from the time planned at the beginning of the semester (TP) were recoded so that a comparison could be made to the actual time spent noted at the end of the semester. The new code, TCE, used the same coding scheme as study time for algebra class (H) reported on the end of the semester survey. The mean for homework time planned at the beginning of the semester was 1.07 (sd = 1.15) and the mean for time actually spent was .73 (sd = 1.01). A paired-samples t-test (Table 23) was calculated to compare the means. A significant difference was found ($t(103) = 2.342$, $p < .05$). Math students that persisted did not keep their word on how much time they planned for doing math homework. They may have been overly optimistic at the beginning of the course.

TABLE 23

t-TEST FOR DIFFERENCE IN NON-REMEDIAL MATH STUDENTS' TIME PLANNED AT THE BEGINNING OF THE SEMESTER AND THE ACTUAL TIME SPENT

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	TCE	1.07	104	1.15	.11
	H	.73	104	1.01	9.88E-02

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	TCE - H	.34	1.47	.14	5.15E-02	.62	2.342	103	.021

<u>Research Question #14: To what extent do goal setting, time planning, and time usage predict non-remedial math students' final average?</u>

Standard multiple regression was conducted to determine the accuracy of the independent variables (goal setting score (GS), time management score (TS), number of exams desired (E), job hours (J), math homework time (H), other class homework time (O), and course difficulty rating (D)) predicting non-remedial math students' final average (FAP). A preliminary examination of the correlation matrix for multicollinearity did not reveal any strong correlations between the predictor variables and all tolerance measures were above .1. Regression results indicated that the overall model significantly predicted non-remedial math final average ($R^2 = .347$, $R^2_{adj} = .300$, $F(7,97) = 7.374$, $p < .01$). The model accounted for 34.7% of variance in final average. A summary of regression coefficients is presented in Table 24 and indicates that only three (goal setting, time management, and difficulty rating) of the seven variables significantly contributed to the model.

TABLE 24

MODEL SUMMARY OF MULTIPLE REGRESSION TO PREDICT NON-REMEDIAL MATH STUDENTS' FINAL AVERAGE

Model Summary[b]

Model	R[a]	R Square	Adjusted R Square	Std. Error of the Estimate	df1	df2	Sig. F Change
1	.589	.347	.300	12.7652	7	97	.000

a. Predictors: (Constant), D, J, E, H, TS, GS, O
b. Dependent Variable: FAP

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8411.006	7	1201.572	7.374	.000
	Residual	15806.250	97	162.951		
	Total	24217.256	104			

TABLE 24 (CONTINUED)

Coefficients[a]

		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
Model		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	92.804	9.177		10.112	.000		
	GS	2.856	1.214	.205	2.352	.021	.885	1.130
	TS	2.422	.948	.222	2.555	.012	.888	1.126
	E	-.435	2.076	-.018	-.210	.834	.942	1.061
	J	-2.049	1.034	-.170	-1.982	.050	.920	1.087
	H	.707	1.342	.047	.527	.599	.849	1.178
	O	-.192	1.494	-.011	-.128	.898	.843	1.186
	D	-7.035	1.617	-.380	-4.349	.000	.881	1.135

a. Dependent Variable: FAP

<u>Research Question #15: What relationships exist between goal setting, time planning, and non-remedial math course persistence?</u>

Of 139 total non-remedial math students who started the courses, 24% withdrew by the end of the semester. Of 117 that persisted to the first exam, 106 persisted to the final (9% attrition for the study). A Spearman's rho correlation matrix (Table 14) was calculated for the relationships between course goal (GV1), individual goal strategies (attendance (A), listening (L), studying (S), homework (SH), test prep (ST), time management (MT), tutoring (T)), number of goal strategies (SC), overall goal setting score (GS), time planned (hours (TP), days (TDS, TD), times (TTS)), overall time management score (TS), and persistence (P, coded 1 if persisted to the final exam, coded 0 if withdrew from course). Course Goal (GV1), days specified (TDS), and times specified (TTS) had significant positive correlations with persistence (rho(115) = .18, $p < .05$; rho(115) = .19, $p < .05$; rho(115) = .20, $p < .05$; respectively). Non-remedial students that had loftier course goals or who specified days or times on their time management schedules persisted to the end of the course.

Research Question #16: To what extent do goal setting and time planning predict which non-remedial math students persist and which withdraw?

Logistic regression was conducted to determine if non-remedial students' overall goal setting score and overall time management score were predictors of persistence. Regression results (Table 25) indicated the overall model was not statistically reliable in distinguishing who persisted and who withdrew (-2 Log Likelihood = 73.706; $X^2(2)=$ 3.674, $p > .05$). The model correctly classified 89.7% of the cases. Wald statistics indicated that neither of the variables predicted persistence. Odds ratios for these variables indicated little change in the likelihood of persistence.

TABLE 25

MODEL SUMMARY OF LOGISTIC REGRESSION TO PREDICT NON-REMEDIAL MATH STUDENTS' PERSISTENCE

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	3.674	2	.159
	Block	3.674	2	.159
	Model	3.674	2	.159

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	73.706[a]	.031	.064

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

TABLE 25 (CONTINUED)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1	gs	.364	.291	1.566	1	.211	1.439
	ts	.267	.221	1.452	1	.228	1.306
	Constant	.839	.714	1.380	1	.240	2.314

<u>Research Question #17: Are there any significant differences between remedial and non-remedial math students' goal setting, time management, and time usage?</u>

Independent groups t-tests were conducted to determine if there were any significant differences in course goal (GV1), individual goal strategies (attendance (A), listening (L), studying (S), homework (SH), test prep (ST), time management (MT), tutoring (T)), number of goal strategies (SC), overall goal setting score (GS), time planned (hours (TP), days (TDS, TD), times (TTS)), overall time management score (TS), persistence (P), and final average (FAP) between remedial and non-remedial math students. Table 26 presents the t-test results for these variables. Significant differences were found for persistence ($t(92.944) = -3.027$, $p < .01$), final average ($t(135) = -4.986$, $p < .01$), attendance ($t(47.216) = 2.212$, $p < .05$), tutoring ($t(116) = -2.276$, $p < .05$), and exams ($t(38.944) = -2.446$, $p < .05$). Remedial math students had lower persistence, lower final averages, listed attendance as a goal strategy more, listed tutoring as a goal strategy less, and desired fewer exams. No significant differences were found for any other variables (i.e. overall goal setting, overall time management, job hours worked, time planned or spent on homework).

TABLE 26

INDEPENDENT SAMPLES T-TESTS FOR DIFFERENCES IN REMEDIAL AND NON-REMEDIAL STUDENTS' GOAL SETTING, TIME MANAGEMENT, AND TIME USAGE

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
P	Equal variances assumed	20.911	.000	-3.238	195	.001	-.23	7.04E-02
	Equal variances not assumed			-3.027	92.944	.003	-.23	7.53E-02
FAP	Equal variances assumed	.561	.455	-4.986	135	.000	-15.1080	3.0299
	Equal variances not assumed			-5.386	55.363	.000	-15.1080	2.8052
GV1	Equal variances assumed	.194	.660	.231	155	.818	2.97E-02	.13
	Equal variances not assumed			.237	70.703	.813	2.97E-02	.13
A	Equal variances assumed	33.264	.000	2.907	155	.004	.15	5.12E-02
	Equal variances not assumed			2.212	47.216	.032	.15	6.72E-02

TABLE 26 (CONTINUED)

L	Equal variances assumed	4.509	.035	1.106	155	.271	7.18E-02	6.49E-02
	Equal variances not assumed			1.009	58.387	.317	7.18E-02	7.12E-02
S	Equal variances assumed	5.809	.017	-1.697	155	.092	-.15	9.13E-02
	Equal variances not assumed			-1.715	68.895	.091	-.15	9.03E-02
SH	Equal variances assumed	12.888	.000	-1.577	155	.117	-.12	7.83E-02
	Equal variances not assumed			-1.750	82.922	.084	-.12	7.06E-02
ST	Equal variances assumed	.172	.679	-.206	155	.837	-1.05E-02	5.08E-02
	Equal variances not assumed			-.211	70.731	.833	-1.05E-02	4.95E-02
MT	Equal variances assumed	5.695	.018	-1.132	155	.259	-6.11E-02	5.40E-02
	Equal variances not assumed			-1.343	96.698	.182	-6.11E-02	4.55E-02
T	Equal variances assumed	7.726	.006	-1.328	155	.186	-4.27E-02	3.22E-02
	Equal variances not assumed			-2.276	116	.025	-4.27E-02	1.88E-02

TABLE 26 (CONTINUED)

SC	Equal variances assumed	1.102	.295	-1.042	155	.299	-.17	.17
	Equal variances not assumed			-.964	59.545	.339	-.17	.18
GS	Equal variances assumed	.106	.745	-1.093	155	.276	-.22	.20
	Equal variances not assumed			-1.056	63.712	.295	-.22	.21
TH	Equal variances assumed	1.630	.204	-1.623	111	.107	-1.4267	.8789
	Equal variances not assumed			-1.873	53.001	.067	-1.4267	.7617
TP	Equal variances assumed	.695	.406	-1.821	154	.071	-1.3280	.7292
	Equal variances not assumed			-1.983	80.027	.051	-1.3280	.6696
TCE	Equal variances assumed	.109	.742	-1.619	154	.108	-.34	.21
	Equal variances not assumed			-1.709	75.100	.092	-.34	.20
TDS	Equal variances assumed	.169	.682	-.207	155	.836	-1.32E-02	6.40E-02
	Equal variances not assumed			-.202	64.944	.840	-1.32E-02	6.55E-02

TABLE 26 (CONTINUED)

TD	Equal variances assumed	.568	.452	-.233	154	.816	-6.29E-02	.27
	Equal variances not assumed			-.241	72.454	.810	-6.29E-02	.26
TTS	Equal variances assumed	2.344	.128	-1.099	155	.273	-9.89E-02	9.00E-02
	Equal variances not assumed			-1.078	65.378	.285	-9.89E-02	9.17E-02
TS	Equal variances assumed	3.529	.062	-1.531	155	.128	-.38	.25
	Equal variances not assumed			-1.600	73.297	.114	-.38	.24
E	Equal variances assumed	11.800	.001	-2.966	135	.004	-.42	.14
	Equal variances not assumed			-2.446	38.944	.019	-.42	.17
J	Equal variances assumed	1.097	.297	.641	135	.523	.17	.27
	Equal variances not assumed			.599	44.556	.553	.17	.28
H	Equal variances assumed	3.630	.059	-.900	135	.370	-.17	.19
	Equal variances not assumed			-1.118	73.758	.267	-.17	.16

TABLE 26 (CONTINUED)

O	Equal variances assumed	.003	.956	-1.456	135	.148	-.26	.18
	Equal variances not assumed			-1.562	54.687	.124	-.26	.17
D	Equal variances assumed	.779	.379	.056	135	.956	9.13E-03	.16
	Equal variances not assumed			.060	55.435	.952	9.13E-03	.15

CHAPTER V: CONCLUSIONS

Significance

"So convenient a thing it is to be a reasonable creature, since it enables one to find or make a reason for everything one has a mind to do."
-Benjamin Franklin (from Moncur, 1994)

The purpose of this study was to investigate the relationships among goal and time management self-regulatory constructs and community college mathematics achievement and persistence. The research regarding SRL in the community college math classroom has been sparse. Therefore, this study aimed to more specifically extend the theoretical framework of self-regulation to college mathematics education. It was hypothesized that students who set better goals (set a goal and have strategies for achieving the goal), have better time-management schedules (set specific times and days and allocate more hours of study time), spend more hours on homework, less hours on job, less hours on other classes, and report lower math course difficulty ratings would have better math course final average and persistence. No relationship between amount of exams desired with math course final average was expected. A particular potential advantage of this study was that if SRL strategies significantly related to mathematics achievement, the mechanism of coaching at-risk students on self-regulatory behavior could become a staple recommendation. Nevertheless, students should be made aware that strategies exist for better learning. Finally the literature reviewed and the results of this study are meant to contribute to the information base of Educational Statistics. Audiences reading this, such as math educators, educational psychologists, educational historians, and counselors are meant to benefit from the knowledge imparted.

This chapter proceeds with a listing of the limitations of the study, which set a context for looking at the results, their strengths and weaknesses, and their generalizability to other settings.

Limitations

There are several limitations to this study. This study was done at only one institution and therefore, this is an issue for generalizing to all community college students. Surveys were voluntary and self-reported. Students' responses for the goal strategy question and time management schedule were subjectively graded. Attrition is a major concern for considering the results. Students who withdrew from the course were not able to participate in the end of the semester survey, and thus were not included in a number of the major analyses. Since the idea of the study is to look at who is successful in terms of self-regulation and why, losing about a third of the sample because they withdrew from the course is a real problem. The results really have to be interpreted not in terms of the self-regulatory behaviors of those students who take math courses at the community college level, but those students who persist to the end of the course. This, too, is an important group of students on its own, but it needs to be noted that it is different from the group of students who try the course.

Conclusions

The study generated useful information regarding math students' goal setting, time management, time usage and their relationships with each other, final average, and persistence. The conclusions will be discussed relative to the perspectives of the research questions and with respect to the previously reviewed literature. For simplicity, conclusions are organized into 3 broad areas (goal setting, time planning, and time usage) concerning remedial and non-remedial students together. It should be kept in mind when considering the results, that non-remedial students were overall better students than the remedial students.

Goal Setting Conclusions

The results of this study showed that overall goal setting score (a measure to rate course goal with strategies) was significantly related to math final average for both remedial and non-remedial students. These findings support similar conclusions made by researchers relating goals to achievement (Arem, 2003; Britton & Tesser, 1991; Ironsmith et al., 2003; Robbins et al., 2004; Roueche et al., 2001) and performance (Locke & Latham, 2006; McEwan, 2000; Pajares & Graham, 1999; Schunk, 1990). There was no significant difference found between remedial and non-remedial students' overall goal setting scores or initial course goals. Over 80% of math students had moderate to high initial course goals (rated 1 or 2 where 2 is the max) thus, suggesting that students were very optimistic. However, initial course goal was significantly related to final average for non-remedial math students but not for remedial students. Non-significance of remedial students' course goals may be indicative of over optimism (see "uninformed optimists," Svanum & Bigatti (2006) and Prohaska (1994)). The significance of overall goal setting score with final average was tied to non-remedial students' initial course goals, whereas final average significance with remedial students' overall goal setting score was due to the number of goal achieving strategies listed. Students at higher level courses may be more realistic about their course goals than lower level remedial students. This is somewhat analogous to findings by Prohaska (1994) relating lower course grade estimation to lower GPA level.

Both remedial and non-remedial students listed some aspect of "studying" as their most frequent goal achieving strategy. Thus, most students were aware they needed to do some outside work to achieve their course goal. However, remedial students listed "attendance" as a goal achieving strategy significantly more than non-remedial students. Some remedial students may not have a notion of stronger self-regulatory strategies. Non-remedial students listed "tutoring" significantly more than remedial students. Since non-remedial students typically tend to have more college experience (i.e. previous math courses) and/or better math placement than remedial students, they may be more aware of stronger self-regulatory strategies and tutoring services. This is a particularly important finding, it seems. The students who, one would expect, need tutoring the most, feel they need it the least. Thus, there is a basic lack of awareness of instructional needs on the part of the remedial students. They need the help, but they do not realize they do.

As for students persisting to the end of the course, none of the goal setting variables for remedial students significantly correlated with persistence. However, initial course goal for non-remedial students did have a low positive correlation with persistence. This finding for non-remedial students is supportive of research discussed by Lock and Latham (2006) and Robbins et al. (2004). Again, in general, the additional experience of non-remedial students may have led them to be more realistic about their course goals and expectations than remedial students.

Time Planning Conclusions

For remedial students' time management schedules, none of the time planning variables (hours, days, times) or overall time management score (a measure to rate the overall time management schedule for hours, days, and times) correlated with final average. It was previously mentioned, that the more strategies remedial students listed the better their overall goal setting score and final average. Yet none of the constituents of their time management schedules were significantly related to achievement. There are several possible explanations for this lack of a significant finding. One would be that students do not have a good notion of what their time needs are and are unable to provide any kind of useful estimate. However, another possibility is that remedial students somewhat know what to do to achieve their goal but do not know how to manage their time appropriately. Remedial students could be overly or underly ambitious about planning their time. This area, time estimation, would seem to be a very useful one to investigate further.

No significant differences were found between remedial and non-remedial students' time planning schedules. Both groups planned to spend about the same amount of hours per week doing math homework (6 for remedial, 7 for non-remedial, difference not significant). However, overall time management score and some of the time planning variables were significantly positively correlated with non-remedial math students' final averages. More specifically students who allocated more hours and specified the days did better in the course. These results resonate similar findings relating homework time to achievement (Cooper, 2001; Cooper et al., 1998; Kim & Placier, 2004; Marlowe et al., 2002; Rumbaut, 1996) and analogous to findings relating to GPA (Britton & Tesser, 1991; Chu and Choi, 2005; Macan et al., 1999; Soltz, 1992). Again reasoning is that remedial math students are not as realistic planners as non-remedial students. Speculation once more is that the higher level students have more college experience and are more aware of how to manage their time. More so, none of the remedial students' time planning variables correlated with persistence. However, non-remedial students who specified days and times on their time management schedules had better persistence than those who did not. Possibly the extra level of specificity on non-remedial students' time management schedules made the difference in seeing who persisted beyond the first exam and who did not.

Time Usage Conclusions

Reported time spent in math homework for remedial and non-remedial students did not correlate with final average. This is contradictory to research that illustrated more homework time yields better achievement (Cooper, 2001; Cooper et al., 1998; Kim & Placier, 2004; Marlowe et al., 2002; Rumbaut, 1996; Soltz, 1992). Both remedial and non-remedial students spent about the same amount of hours per week doing math homework (5 for remedial, 6 for non-remedial, difference non-significant). Both groups reported spending one hour less than what they planned in their time management schedules. Further, a significant difference was found between non-remedial students' time planned at the beginning of the course and actual time spent. Non-remedial students that persisted to the final did not realize their estimates on the time they planned at the beginning of the semester whereas, remedial students did. Either non-remedial students were overly optimistic about their time planned at the beginning of the course or students who withdrew from the course may have accounted for the extra planned hours. Again, students who withdrew after the first exam did not turn in end of the semester surveys.

The majority of math students reported spending 0-6 hours per week on their math homework. This would contradict recommendations for outside homework time to exceed the 2:1 ratio, that is, 2 hours of homework time for every hour of in class instruction (Bittinger, 2003; Frisk, 1998; RUMD, 1998; Truchon, 1997) but stays within state mandated unemployment/welfare program study time that call for 2:1 or 1:1 ratios (Kirby et al. 2001; Pandey et al., 2000). A possible explanation for students who spent smaller amounts of study time on the course and still were able to pass or do well is that they may have already had the same or complementary level subject recently in high school. Other explanations are that some students may memorize information better than others or made better use of their study time.

Other class homework time also did not correlate with final average for both remedial and non-remedial math students. Hence, no conclusions can be made as to spending time on other class homework in association with math achievement. On average, remedial students spent about 7.4 hours per week on other class homework, while non-remedial students spent about 9.7 hours per week. Difference in hours between the groups was not significant.

Taking into account math homework hours, remedial students spent about 12.5 hours per week altogether on homework while non-remedial students spent about 15.5 hours. These figures exceed estimates by Soltz (1992) which found community college students spending 11 hours per week on homework. Further, the more hours non-remedial students spent on other class work, the more hours they spent on math homework. The same case did not apply to remedial students. Nevertheless, time spent on other class hours is dependent on how many other classes a student is taking. Non-remedial students may have more classes to devote time to because remedial students are somewhat restricted to what courses they can take as result of their placement.

Most of the students in this study spent a large amount of time engaged in employment. Amount of job hours worked per week did not correlate with final average.

This is not consistent with research that found more job hours to be associated with better achievement (Bradley, 2006; Marlowe et al., 2002) or less hours to be associated with better achievement (Bradley, 2006; Barone, 1993; Singh & Ozturk, 2000). However, there was a significant association found in that non-remedial students who specified days in their time management schedules worked less job hours. Some students indicated on their time management schedules that they were not able to specify math homework days or hours because of varying job schedules.

Remedial students worked about 27.6 hours per week for a job and non-remedial students worked about 25.8. Difference between groups was not significant. These findings are less than national estimates (NEDRC, 2000) that found community college students work about 36 hours per week; but a bit more than Soltz (1992) estimates of Johnson County Community College students who work 22.9 hours per week. However, the highest percentage of both remedial and non-remedial students worked in the greater than 35 hours per week category. More so, the percentage of non-remedial students was less than the percentage of remedial students in the greater than 35 hours category. Reasoning again could be that non-remedial students may take more courses and have less time to work. Lastly, greater than 80% of both remedial and non-remedial students worked 15 hours or more per week. This result echoed findings by Bradley (2006), NEDRC (2000), and Phillippe and Patton (2000).

Goal Setting, Time Planning, and Time Usage (Altogether) Conclusions

Multiple regression was performed to determine how strongly related the variables of overall goal setting score, overall time management score, number of exams desired, job hours, math homework time, other class homework time, and course difficulty were to mathematics final average. The overall model was not significant for remedial algebra students but was significant for non-remedial math students. Three variables significantly contributed to the model for predicting non-remedial students' final average: overall goal setting score, time management score, and course difficulty rating. A possible implication of this finding is that if a non-remedial math student's answers to the goal setting question, planned time management schedule, and how he/she rated the difficulty of the course were known, one might be able to accurately predict his or her final average in the course. This model accounted for 35% of the variance in final average. Other factors that could account for the rest of the variance, as suggested by research, are previous math achievement, motivation, memory, anxiety, and/or efficacy.

Logistic regression was performed to determine if the combination of overall goal setting score and overall time management score predict persistence (beyond the first exam) for math students. The model was not significant for remedial algebra students or non-remedial math students. Goal setting and time management do not yield any useful information regarding math student persistence beyond the first exam. No surveys were obtained for students who withdrew before the first exam and could be grounds for further study.

Recommendations for Practice

Since overall goal setting was significantly related to math final average for both remedial and non-remedial students, and was a significant contributor in the model for predicting non-remedial students' final average, goal setting should be encouraged by math educators and counselors. However, goals should be realistic as suggested by research (Hagen & Weinstein, 1995; Prohaska, 1994; Schunk, 1990; Svanum & Bigatti, 2006). Math educators, first-year workshops, orientations, and math textbooks could explain the skills necessary to succeed in math courses and meaningful strategies that support students' course goals (Arem, 2003; Bittinger, 2003; Cuseo, 2003; McEwan, 2000; Svanum & Bigatti, 2006; Roueche et al., 2001; Trawick & Corno, 1995).

None of the time planning variables were correlated with remedial student final average or persistence; yet overall time management score was significantly related to non-remedial final average and a significant contributor to the model for predicting non-remedial math students' final average. This may help to explain problems with remedial math course completion especially in comparison to non-remedial course achievement. Remedial students may not know how to create time management schedules and thus, would help to explain the unpredictability in their math achievement and persistence. Once again, an implication here is that math educators, first-year workshops, orientations, and math textbooks could teach the skills necessary for students to create suitable, realistic time management schedules (Arem, 2003; Bittinger, 2003; Cuseo, 2003; McEwan, 2000; Trawick & Corno, 1995).

Over 80% of community college math students in this study worked at least 15 hours per week. This statistic alone implicates the need for students to learn time management scheduling. Both remedial and non-remedial students worked more job hours than on all class homework (including math and other classes). It was previously noted that 25% of students miss class because of work (Soltz, 1992). Moreover, Geddes et al. (1992) reported a leading reason for students dropping out of community college was to work more hours. Thus could have been the case with remedial students in this study. Therefore, time management learning is again recommended.

Students who persisted to the final exam spent about 5-6 hours per week on their math homework with more than half spending 0-6 hours per week. Furthermore, math homework time spent did not significantly correlate or contribute to the model with predicting final average or persistence. Hence, with all the responsibilities (school, job, family, house maintenance, recreation, etc.) students have, especially the non-traditional community college student, an approach to instruction that demanded less homework time is worth considering. How this could be accomplished while maintaining achievement standards would be a difficult question. Possibilities could include homework sessions that are included as part of the course (i.e. attend the lecture and attend a homework doing session). This may be a suitable compromise to researchers who highlighted negative effects of too much homework, such as negative attitudes (Cooper et al., 1998), interference with family functions, issues with socialization (Dudley-Marling, 2003; Kralovec & Buell, 2000), and dropping out (Geddes et al., 1992; Kralovec & Buell, 2000).

Recommendations for Future Research

It would be very useful to follow up this study with a straight-forward cross-validation. A sample from a future semester of math classes can be used with prediction equations from this study. Answers submitted to questions in the surveys could be input into this study's regression equations. Differences between the predicted grades and the actual grade could be calculated and analyzed for predictive validity and generalizability.

Other variations of this study could be used for future research. The goal question that was used in this study allowed for broad responses and thus, inter-rater reliability was inadequate for the overall goal setting score. A future goal question should allow for more specific responses. One variation could be more similar to Prohaska's (1994) or Svanum & Bigatti's (2006) grade prediction question. The question would be: "What grade do you predict?" and then a space asking for specific number between 0 and 100% or multiple-choice responses for grades "A" thru "F" would be given. Since, inter-rater reliability was inadequate for the count of goal achieving strategies, a multiple-choice format could be recommended for goal achieving responses. This would take out the subjectivity of rater grading and create a more direct scale. The survey could be also be written in computer code and given online to allow for ease of analysis.

For the time management schedule, a similar multiple-choice design could be used as well. The question calling for math homework times could be broken down more definitively into multiple-choice parts asking for total number of hours per week, specific days, and specific times. Again, the objective would be to take out the subjectivity of rater grading and create a more direct scale. An online version of the survey would also be preferred for straightforward analysis.

As previously discussed, the data did not produce any significant results in predicting persistence. Both remedial and non-remedial goal setting and time management did not predict which students would persist beyond the first exam. Students who withdrew before the first exam did not turn in goal or time management surveys and were not included in the study. Since this study was not able to collect data on students who withdrew before the first exam, another possible study is to gather information from all students before the first exam, if possible.

Another issue of survey research is the matter of students following directions and simply doing what was asked. Some students were given back the survey and time management schedule because it was either incomplete or blank. Upon entering the class, students were asked to read the instructions on paper (i.e. end of semester survey) or on the board and then directions were re-explained again verbally, and yet students handed-in incomplete surveys. These issues illuminate matters that could be modified for further study (i.e. following directions as a lurking variable, motivational aspects of following directions, direction following and achievement, etc.). A correlational study between following directions and math achievement would also be of interest.

The data set used in this study could be analyzed in other ways. Studies that examine students categorized into high or low groups with respect to their goal setting, time planning, job time, homework time, final average, or persistence could be done. Since there were three statistics courses that generated data for non-remedial students, a future study could analyze self-regulatory factors of students in statistics versus non-statistics courses.

Finally, since the results of this study were inconclusive with regard to homework and job time, more research in these areas is recommended. For example, a future study could more closely examine differences between students grouped into homework time categories (i.e. those that spent 0-3 hours per week versus 3-6 hours per week versus 6-9 hours week, etc.) or students grouped into job time categories (i.e. like Bradley's (2006) comparison of those that work 20 hours or more versus those that do not work). Other future studies could include: analyzing how soon students should complete their homework after lecture, how long should they spend on homework, how far apart (days) should they spread out their study sessions, and effects of job time on study time.

Final Thoughts

The epitome of the self-regulated learner, Benjamin Franklin, founded the public library as a means to allow open access to learning for all. In 21st century America, perhaps the best realization of Franklin's dream is the community college. Franklin in the 18th century was one of the first advocates of a more comprehensive liberal arts curriculum and education accessibility. Although libraries permeate modern American society (Chute et al, 2005), it is community colleges that truly embrace the vision of allowing everyone regardless of trait to benefit from a college education. Phillippe and Patton (2000, p.140) predict: "As the overall population increases, community college enrollments are expected to increase." Further, the end of the Iraq and Afghanistan Wars and their reconstruction periods in the new millennium will bring yet another wave of GI's to college.

A look to the future will continue to bring technological advances and thus, a continued demand for a more technically educated society with advanced degrees. More so, the higher the educational attainment, the higher the mean earnings (U. S. Census Bureau [USCB], 2006, Table P-28). Mean earnings even for an associate degree are higher than those with no degree or just a high school diploma (USCB, 2006, Table P-28). The National Council for Teachers of Mathematics (2000) prophesied:

> In this changing world, those who understand and can do mathematics will have significantly enhanced opportunities and options for shaping their futures. Mathematical competence opens doors to productive futures. A lack of mathematical competence keeps those doors closed… All students should have the opportunity and the support necessary to learn significant mathematics with depth and understanding. (p. 5)

Moreover, traditional classrooms will meet increased competition from online learning programs and distance education. The easy accessibility of the internet will make it more convenient for people to stay at home rather than to have to transport themselves to a classroom. However, online environments may require more highly motivated, self-regulated learning behaviors. Thus, more pertinent research will be needed.

In any event, students should have the willingness (goals) and motivation to learn. It is then imperative that students' hasten this willingness with action (self-regulation). Educators and counselors should encourage goal achieving beliefs and teach self-regulatory behavior (i.e. managing study time, job, family, recreation, etc.) to foster not only math course success but for success in life.

The study conducted in this dissertation demonstrated the strength of the relationship between self-regulation and achievement in mathematics. The consequences and foundations of low math achievement were highlighted. The problems that math students face in having faulty expectations and inadequate time management practices were discussed. The burden of educating students on self-regulatory practices and their effects falls on teachers and counselors. If students come to class unaware of these techniques and their usefulness, it is clearly incumbent upon teachers to help students develop these skills. If our goal is not simply to teach mathematics, but to have students learn mathematics, we must take the extra steps necessary to help students engage in the behaviors necessary to ensure their success.

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APPENDICES

Appendix A
Goal Survey

INSTRUCTOR GRAMLICH **COURSE & SECTION#: ____________________**
COURSE NAME: ______________ **SEMESTER: ____________________**

I have read and understood "General Prospectus" and "Directions for Hand-in Assignments:"
Student Signature______________________________________

Name: J#:

Address: Major:

Year(s) in college:

Country of Origin: Career Objective:

Phone:
Email: Hobbies:

Other classes & when:

Where work & schedule:

Last math class taken, when, and grade received:

Why are you taking this course?

What math class(es) are you planning on taking in the future?

What is your goal for this course and how do you plan to achieve it?

What do you find is/are the best resource(s) to help you learn math?

How many exams would you like?

How do you feel about quizzes, checking of homework, etc?

What ideas do you have that you think would make this class more productive?

Appendix B
Time Management Schedule

TIME MANAGEMENT SCHEDULE:
(Days and Times when you will do your math homework)

Commit yourself now!
Additional Comments:

Appendix C
End of the Semester Survey

END OF SEMESTER SURVEY QUESTIONS

I understand that my answers to these questions will be used solely for research/course evaluation purposes and that my responses will have NO affect on my final grade in the course.

Signature______________________________ Date_________

Circle Responses.

#1
In retrospect, how many EXAMS would you have liked for this course?
A) 1 B) 2 C) 3 D) 4 E) >4

#2
How many hours per week do you work for a full or part-time JOB?
A) 0-6 B) 6-15 C)15-25 D) 25- 35 E) >35

#3
How many hours per week did you study (hw, reading, etc..) outside of class time for THIS course?
A) 0-6 B) 6-9 C) 9-12 D) 12-15 E) >15

#4
How many hours per week did you spend (hw, reading, etc..) on OTHER classes (outside of class time)?
A) 0-6 B) 6-15 C) 15-25 D) 25- 35 E) >35

#5
How would you rate the DIFFICULTY of the content of this course?
A) Very Easy B) Easy C) Average D) Hard E) Very Hard

CURRICULUM VITAE

Stephen Peter Gramlich
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Education:

June, 1996	Drexel University, Philadelphia, Pa Master of Science in Mathematics Concentration in Probability & Statistics
May, 1993	Rowan (Glassboro State) University, Glassboro, NJ Bachelor of Arts in Mathematics NJ Provisional (Secondary) Teacher Certificate in Math Semester at Uni of Northumbria, Newcastle, England
June, 1988	Delran High School, Delran, NJ Academic, Wrestling, and Soccer Honors AUR

Teaching Experience:

Spring 1998- current	Community College of Philadelphia, Philadelphia, PA Mathematics Assistant Professor: (traditional and online) Arithmetic, Elementary Algebra, Intermediate Algebra, Data Analysis, Linear Math, Probability, Precalculus I, Econ Statistics I, Statistics for Science, Calculus I Website: http://faculty.ccp.edu/faculty/sgramlich
Winter 2006-2007	Peirce College, Philadelphia, Pa Adjunct: Business Statistics II (Hybrid Course)
Fall 1996-Spring 2001	Rutgers University, New Brunswick, NJ Adjunct: Elementary Algebra, Intermediate Algebra, PreCalculus I, PreCalculus II, Statistics for Business
Fall 1997	New Jersey Institute of Technology, Newark, NJ Lecturer: University Math I, Calculus II
Fall 1996-Summer 1997	Middlesex County College, Edison, NJ Adjunct: Algebra I, Probability & Statistics, Statistics II
Fall 1994-Summer 1996	Camden County College, Camden, NJ Adjunct: PreAlgebra, Elementary Algebra, College Algebra & Trigonometry, Elements of Statistics
Fall 1993-Spring 1995	Drexel University, Philadelphia, PA Mathematics Teaching Assistant: Math Analysis I, II (non-science majors), PreCalculus, Calculus for Business, Calculus for Engineering