COLLEGE SUCCESS FOR ALL STUDENTS: AN INVESTIGATION OF EARLY WARNING INDICATORS OF COLLEGE READINESS

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The purpose of this quantitative study was to determine early warning indicators of college readiness among early college high school students at selected Texas institutions of higher education. Participants in this study included 134 of the class of 2010 from two early college high schools. The graduates were 86% Hispanic, 8% African American, 3% White, 2% Asian, 1% American Indian and 72% economically disadvantaged. A causal-comparative research design using multiple regression analysis of the data collected revealed that each one unit increase in world history was associated with a .470 ($p < .05$) increase in college GPA, while each one unit increase in Algebra I was associated with a .202 ($p < .05$) increase. Therefore, student grades in high school Algebra I and world history were the strongest statistically significant indicators that a student will maintain a 2.5 college GPA during the first year of college. According to the early warning indicators, students who maintain a grade of A or B in Algebra I are 10 times more likely to be college ready while having a 78% chance of maintaining a 2.5 or better in college courses. Further, the findings from this study found no significant relationship between TAKS assessment, socioeconomic status, gender or ethnicity and a student’s ability to maintain a 2.5 or higher college GPA. Based on the findings from this study, the author recommends an examination of the high school curriculum with the goal of ensuring that students gain competency in courses that indicate college readiness.
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CHAPTER 1
INTRODUCTION

A recent ACT report (2009b) indicated that approximately 23% of high school graduates who took the ACT assessment were prepared for college upon graduating from high school in the 2008-2009 academic year. The report suggests that too many students, especially minority students, graduate without the necessary skills for success in college. While an increase in enrollment in higher education has occurred in the United States, research findings show that 42% of incoming freshmen at 2-year colleges and 28% at 4-year institutions lack the necessary academic skills to enroll in entry level college courses without first enrolling in remedial courses (Hart & Lee, 2008; Writ, 2004). Prior research has indicated that enrollment in remedial courses not only extends the time for a student to graduate from college, but becomes costly to both higher education institutions and students, with costs exceeding $1 billion annually (Strong American Schools, 2008).

The notion of students enrolled in remedial courses begins to question the quality of secondary schools and the purpose of the high school diploma. More succinctly, what do high school diplomas represent if students are not prepared for college-level courses or entry level jobs? While there are those who argue that schools must do more than prepare students academically, Martinez and Klopott (2005) revealed that reform efforts are currently underway across the nation focusing on identifying not only academic behaviors but also on identifying social behavior as an early indicator of college readiness. Tools used to make this identification include Advancement via Individual Determination (AVID), First Things First (FTF), High Schools That Work, Gaining Early
Awareness and Readiness for Undergraduate Programs (GEAR UP) and small learning environments. Due to national concerns with college readiness, the primary objective of our secondary education system should be to provide all students with the necessary academic skills and activities designed to help them succeed beyond high school whether it is through college or the workforce (Conley, 2010).

Education Transformation Movement

Throughout American history, education scholars have conducted studies in an attempt to predict the future implications of higher education (Goldstein, 2006). Focusing on college readiness (ACT, 2008a; BGMF, 2009b), the objectives of these research efforts have included identifying ways to provide opportunities for not only access, but also attainment of a quality postsecondary education (DOE, 2006). College access and higher educational attainment has become a national priority as evidenced by President Obama who addressed the United States Congress on February 24, 2009 with the following vision and challenge for higher education:

In a global economy where the most valuable skill you can sell is your knowledge, a good education is no longer just a pathway to opportunity, it is a pre-requisite. That is why it will be the goal of this administration to ensure that every child has access to a complete and competitive education – from the day they are born to the day they begin a career. (Obama, 2009)

From the early 1980s, with the publishing of the landmark report, A Nation at Risk: The Imperative for Educational Reform, 1983, the foundation for current education reform efforts, (DOE, 2008a) through the 21st century, policy makers and educators continue to agree on the necessity of empowering all students with the essential knowledge and skills not only to succeed in high school, but also to increase access
and maintain persistence in college and success in the workplace.

College Ready

Common newspaper headlines in America feature such titles as: “Many Graduates Not Ready for College Work,” “State Reports Shows Many Students Are Not Ready for College,” and “Survey: High School Fails to Engage Students” (Hegarty, 2002; Ngowi, 2008; Sanoff, 2005). Realizing the current crisis in education, government agencies and educational partners are focusing on a common goal of improving the education systems, resulting in more students prepared for college. For example, P-16 Initiatives began in the 1990s focus on creating programs that provide a seamless education transition from preschool to post-secondary (Krueger, 2006; Tinto & Pusser, 2006). The challenge facing such initiatives and policies focused on post secondary education reform is determining just what measures provide indicators of whether or not a high school graduate is college ready. College readiness has been defined as “the knowledge and skills students need to succeed in an entry-level college course from a post secondary institution that offers a baccalaureate degree or transfers to a baccalaureate program without remediation” (Achieve, 2009a; ACT, 2009; BGMF, 2009a; College Board, 2008; THECB, 2008; Conley, 2007; TEA, 2007). David Conley (2007), founder of Educational Policy Improvement Center (EPIC) who studies issues relating to college readiness, goes further when he defines college success as “completing the entry-level course with a level of proficiency and understanding, which enables the student to move to the next level in the course sequence” (p. 5). Based on
the aforementioned definitions of college readiness and success, many American high school students are not prepared for college, according to this definition.

With existing legislative policy and the recent challenge from the president of the United States, all levels from preschool to higher education feel the demanding accountability pressure to determine indicators of how all students can be successful in achieving some form of post secondary education regardless of race, ethnicity, gender, language or socioeconomic level (Obama, 2009; DOE, 2006; DOE, 2002). Accountability calls for hard data as evidence that instructional programs are preparing all students with the essentials skills to achieve success in college.

Maximizing school data as an informational tool for continuous improvement of school and student performance provides a way to inform policy, management, and instructional changes needed for improved student achievement (Lachat, 2002). With school data readily available and technology continuing to emerge, the challenge to states lies in determining the college-ready indicators that target success in closing the achievement gap, the difference in academic performance between different ethnic groups (SEDL, 2009). Some studies recommend the implementation of data reform using longitudinal database systems within classrooms to provide the essential tools teachers need to effectively track student growth (Dougherty, 2010; ACT, 2008a; ECS, 2002; Massell, 2000). However, the key to the success of data systems requires that all stakeholders in the education system have the ability to access, understand and utilize the data. (DQC, 2009).
College Readiness Initiatives

In an attempt to accelerate the college readiness reform initiatives, private foundations, educators, policy makers and non-profit organizations are collaborating to create solutions for providing a seamless education transition from K-12 to post-secondary. Secondary school administrators have realized that they must develop a plan of communication on how to revise and improve the college skills necessary for student academic success and productivity after high school graduation. Aligning secondary curriculum, assessments and graduation requirements with college knowledge and skills necessary for student success in entry-level college courses (without remediation) is an approach policy makers should support. This could be a way to ensure all students are successful beyond high school (Conley, 2010; Achieve, 2009b; Roderick, Nagaoka, & Coca, 2009; Conley, 2005).

Establishing a set of college readiness standards (CCRS) is the first step toward understanding what knowledge, skills, habits and expectations are needed for students to have to experience success in entry level college courses. American College Testing (ACT), the College Board, the states of Washington and Texas, and the Association of American Universities have developed CCRS, while a national set of standards is in development (Conley, 2010; THECB, 2008; EPIC, n.d.). The American Diploma Project (ADP) Network, which involves 35 states, is collaboratively working to close expectation gaps—an alignment of high school standards to post-secondary expectation. One of the ADP Network’s action plans includes the development of a national set of CCRS standards that are aligned with high school curriculum, assessments and graduation requirements (Achieve, 2009b).
The U.S. Department of Education set aside competitive funding for the Race to the Top program to be awarded to states that develop and implement education reform efforts that improve rates of students graduating college ready (Achieve, 2009a). This program was developed in recognition that alignment and development of college and career standards is important for high school graduates to be successful beyond the passing of the state exit exam for graduation.

Realizing our nation is in a college-readiness crisis, many education reform efforts have embedded high school strategies targeting student achievement and college preparedness in efforts to increase college success behaviors. For example, many states have increased the number of core courses (4 years of English and 3 years each of math, science and social studies) required for high school graduation. While increasing the quantity of core courses does not guarantee college ready students, that increase is considered to be one of the leading indicators of college preparedness and attainment in schools (Adelman, 2006; Dounay, 2006; Schmeiser, 2006).

For reform efforts to be successful, educators, policymakers and administrators must view the education system as one unified system that includes Grades PK-16. They must work to create more fluid movement from high school to community college to four-year college or university. Currently, 63% of the community college students return for the second year while approximately 64% of students complete baccalaureate degrees within six years (National Center for Public Policy and Higher Education, 2004). These alarming college persistence to a four-year degree rates reinforce the urgency to transform American education to improving college readiness programs to increase college completion (Krueger & Rainwater, 2003).
Problem Statement

Many policymakers have implemented innovative programs to ensure the success and opportunities for all students, including first generation and minority students, to attend college. The problem is that school-level teachers and administrators may not have the tools necessary to assess college readiness. In this area, the challenge is providing data (i.e. course grades and state standardized assessment results), to teachers that include early warning indicators of college readiness as well as future college success so that they can help impact change in academic instruction.

Purpose of the Study

The purpose of this study is to determine early-warning indicators of college readiness among high school graduates using the instrument, Data Comprehensive Analysis Tool (DCAT™). This tool will be used to determine whether or not an individual student is on target for college readiness as early as 6th grade.

Research Question

The following research question guides the current study:
What are the early warning indicators of college readiness among early college high school students at selected Texas institutions of higher education?

Significance of the Study

Studies have shown that in Texas community colleges, more than 10,000 students have enrolled in remediation courses (Saxon & Boylan, 2001). The enrollment numbers in remediation courses is on the rise. Researchers agree that one factor
contributing to this issue is high school students who are academically unprepared for college or entry level employment positions. Results from this study can provide policy makers, local school districts, and higher education institutions with additional information of early warning indicators of college for success beyond high school. Studying the relationship between high school GPA, year-end course grades, attendance and TAKS assessments and gender, race, and socioeconomic status also provides additional information for colleges and universities to address with students who enroll in college unprepared and to identify potential at-risk college students. The findings could potentially assist middle school and high school teachers and campus administrators in data driven decision-making when determining interventions for individual students in keeping them on track for college readiness for all students.

Definitions of Terms

For the purpose of this study the following definitions were considered:

*College readiness* for this study is the operational definition used by David Conley (2007), “level of preparation a student needs in order to enroll and succeed in college - without remediation - in a credit-bearing general education course at a postsecondary institution that offers a baccalaureate degree or transfer to a baccalaureate program” (p. 5).

*Early warning indicators* of college readiness are a set of measurable indicators related to college readiness that can be tracked regularly over time at local and district school levels (Bryant & Walsh, 2004).
College success is defined as the student completing the first year of college with an overall 2.5 GPA and persisting in college to the second year (ACT, 2007). This study focuses on the 2.5 GPA as the definition for the future of college success.

Texas Assessment of Knowledge and Skills (TAKS) is the state assessment program mandated by the 76th Texas legislature. TAKS assesses the student’s knowledge of the state curriculum in Grades 3-9 reading; Grades 4 and 7 writing; Grade 10 and exit level English language arts; Grades 3-10 and exit level mathematics; Grades 5, 8, 10, and exit level science; and Grades 8, 10, and exit level social studies. Texas requires students to pass all 4 sections of the exit level assessments in order to graduate from a Texas public high school (Texas Education Agency, 2010).

Limitations

Originally, the study was to include 5 early college high schools in the State of Texas. The data collected from 3 of the 5 campuses were incomplete, thus these early college high schools were excluded from the study. Therefore, this study is limited by the fact that the findings may not be generalizable beyond the selected early college high schools and the Texas higher education institutions, as was the original intent, due to the sample size. An additional limitation is that student ethnicity population is not diverse so the findings cannot be generalizable to all ethnicity groups. The schools collect and report the data to the Texas High School Project which does not allow for verification of accuracy.
Delimitation

The sample was limited to students enrolled in early college high schools in Texas. Therefore, the results cannot be generalized to other early college high school in the nation.
CHAPTER 2
LITERATURE REVIEW

This review focuses on literature and research that explores post-secondary success indicators; K-16 education reform initiatives; data-driven decision making implementation; and predictive growth models. All of these topic areas explore the importance of early warning indicators in predicting college readiness to student success beyond high school.

Indicators of Post-Secondary Success

Research conducted by Jobs for the Future (JFF; Hoffman, Vargas, Venezia & Miller, 2007) and Adelman (2006) regarding college readiness consistently shows that a rigorous high school core curriculum is one of the strongest factors to ensure college success without remediation. The results from their studies illustrate significant evidence that middle school math grades, even as low as 6th grade, are plausible early academic indicators among high school graduates that predict the likelihood of college freshmen taking remedial courses in mathematics. In addition, Edmonds (2010) conducted an experimental study comparing student outcomes in college prep course taking of early college high school and traditional high school students and the impact on success in college. She found that students not completing Algebra I by the end of the 9th grade year found it harder to complete college prep courses which significantly impacted their success in college. ACT studies (2008a) have yielded similar results, suggesting that the higher level of math courses taken in high school have a positive impact on college readiness and student success. The positive effects of taking higher
level math courses at an earlier age have led to the less likely need for remediation courses in college and a higher GPA in core college courses.

While taking more rigorous math courses revealed promising evidence of postsecondary success, disappointing evidence from ACT’s college readiness programs show that only 1 out of 10 8th grade students are on target to experience college success (ACT, 2008c). This means 90% of 8th graders do not enter high school with the necessary knowledge and skills to eventually even graduate from high school. Other data illustrate the importance of academic intervention beginning during middle school years if American young people are to have a chance to graduate “College ready, career ready, and life ready” (ACT, 2008b; Texas High School Project, 2010).

Hersh (2009) and Wolk (2009) hold that America must realize we as a nation are at risk when it comes to education. Elementary and secondary education together builds the foundation that determines the readiness and success of students’ future in college. ACT (2008b) research on middle school students shows that college readiness have a strong impact on whether or not students will graduate on time from high school and a positive impact of whether they will be on target to be ready for college-level work. Further, studies conducted by ACT (2006a) show students who are behind in reading in middle school will most likely never catch up. Unrealistic expectations often set up the transitioning 8th graders for failure when they enter high school without the necessary knowledge and skill sets for success.

Offering students an opportunity of a rigorous curriculum from Grades 6-12 demonstrates to be one of the single most proven factors of college success of students regardless of gender, ethnicity, and socio-economic status. The earlier K-12 education
initiatives begin identifying, implementing and aligning college preparation strategies and interventions which allows a seamless transition from middle school to college for all students (ACT, 2008b).

In the past decade, student performance in rigorous secondary courses as it relates to GPA/class rank has moved to the forefront as a leading indicator of college preparedness by many higher education institutions as admission criteria. GPA/class rank is not always an indicator of student success when high school salutatorians and valedictorians enroll in college and need remedial courses (Conley, 2010; Detroit Free Press, 2010). This example shows evidence that high schools need the capability to identify the early warning indicators of college readiness for entry-level college courses before graduation. More succinctly, the primary goal of high schools’ should be to ensure students’ academic success in college, not just access.

Another limitation of using GPA/class rank as an indicator of post-secondary readiness is the problem of compression of grades or weighting of particular courses. National Assessment of Educational Progress (NAEP; DOE, 2007) conducted a high school transcript study in 2005 which found students to be more prepared for college according to the high school transcripts in 2005 than in 1990, but the variation can be attributed to grade inflation and changes in grading standards.

Colleges also use achievement tests such as ACT and SAT to determine the student’s cognitive ability, basic skill, content knowledge, and core academic skills (Roderick, Nagaoka & Coca, 2009). A study of college access and success by ACT (2009) indicated the higher the score on the ACT assessment the more likely the student possessed the necessary college readiness skills. Sawyer’s (2008) ACT report
in 2009 revealed that only 20% of the ACT-tested high school graduates were eligible to enroll in entry-level college courses according to their ACT scores. In an effort to track college preparedness, ACT has developed two assessments, EXPLORE and PLAN to be used in 8th and 10th grade as early indictors for college readiness. The College Board’s SAT assessment purpose also measures a student’s potential success in college. A validity test of the SAT (2008) by the College Board indicated a strong correlation to predicting first year college grades. While most agree that ACT and SAT assessments are good indicators of college preparedness, other researchers and educators oppose the view that the ACT or SAT is a good determiner of success beyond the first year (FairTest, 2007). Conley (2010) views the value of ACT and SAT assessments as a useful source of college preparedness. The problem with these two national assessments is that they are not aligned to the states’ content and standards.

Conley (2007/2010) and other education reformists affirm that indicators of college readiness that include content knowledge is important for student success in college, but a lack of college knowledge skills or awareness of college survival skills can cause failure for many during their first year of college. These non-academic and social factors such as motivation, self-discipline, engagement, and self-efficacy also play an important role and influence on a student’s preparedness and success in college. Astin’s (1993) I-E-O (input-environment-outcome) impact model aligns with this viewpoint. I-E-O model discusses how the input factors, academic and social experiences brought to college, have a direct correlation to the student’s involvement and success in college (Pascarella & Terenzini, 2005). Mastery of study skills is an integral component for college success. Studies conducted by ACT (2007) reveal
students who spend more quality time engaged in schoolwork show a higher potential of academic achievement. Other findings have shown a positive correlation between student engagement and academic achievement (Fredricks, Blumenfeld, & Paris 2004). The Third International Mathematics and Science Study (TIMSS) (Peak & National Center for Education Statistics, Office of Educational Research and Improvement, 1996) reported U.S. 8th graders spend more time after school watching television than engaged in homework, which was found to have a negative impact on their academic achievement.

Kuh (2007) holds that for the odds to ever improve in closing the achievement gap and improving college preparedness, it is becoming increasingly important to focus the priority on developing students’ precollege study and behavioral skills associated with higher education success. Alone, “non-academic” factors such as motivation and engagement will not guarantee a student’s success in college, but findings by Tinto and Pusser (1996) and Astin (1993) suggest that these factors strongly contribute to a student’s academic achievement and persistence (Pascarella & Terenzini, 2005). An ACT (2004b) research study found non-academic factors; academic self-confidence and achievement motivation have a positive correlation to the student’s college GPA. The recommendations from this study suggested that postsecondary institutions design and develop programs that incorporate academic and nonacademic components to address the needs of the whole student.

K-16 Initiatives

Predicting college readiness through K-16 alignment initiatives provides an
avenue for improving college success. K-12 education reform initiatives focusing on improving the seamless transition from high school to college should prepare students to be academically, socially, and psychologically sound for the first year of college. Students entering college with these cognitive strategies developed are more likely to experience post-secondary success. Studies by Conley (2010) and Van de Water and Gordon-Krueger (2002) have found that higher education faculty expresses students too often that are unsuccessful in college when these behaviors have not been developed. In the past decade, many states have passed P-16 legislation in an effort to identify the indicators to improve student achievement and college preparedness, but more research is still needed on the impact and what has worked through these projects (Van de Water et al., 2002). Some states have strategically focused on college preparedness in an effort to increase college attainment rates. Even with these college readiness policies, improvements in college success has not increased based on the percentage of students still required to enroll in remedial courses (Callan, Finney, Kirst, Usdan & Venezia, 2006).

A dual enrollment program is an example of a K-16 initiative where many state policymakers have observed a positive impact on college success. Dual enrollment programs allow students who have often not been considered “college bound” an opportunity to access the college experience. Dual enrollment allows the high school student to receive credit for the course at the college and high school. Dual enrollment not only benefits students, but also allows schools to monitor their college progress and provide interventions, if necessary, to ensure success. Researchers such as Conley (2010) and Hughes (2008) support the idea that dual enrollment students often
experience increase in motivation; decrease remediation in college; increase student engagements; and an eased transition into post-secondary status. A review of the literature provides many examples of students participating in dual enrollment programs that show a positive correlation to students’ participation and success in postsecondary endeavors after high school. The findings included: positive impact on male and low socio-economic students; students more likely to graduate from high school; enroll in college full time; persistence in college to 2nd year; and higher GPAs (Hughes, 2008; Swanson, 2008; Hartman, 2007; Adelman, 2006; Bailey, Hughes & Karp, 2002). While findings from studies by Joni Swanson (2008) that dual enrollment programs have shown a positive correlation to college success.

Dual credit programs are the foundation for many innovative college readiness programs such as the early college high school initiative, a blended high school and college model focused on supportive and rigorous curriculum to create a seamless transition between the high school and college experience for the underrepresented student in higher education (THSP, 2010; Nodine, 2009).

Postsecondary preparation studies often target the examination of high school students’ college readiness as it relates to attending a four-year institution not to community college goers. According to Cohen (2003), more than 300,000 of the 2.2 million students who begin college each year start their post-secondary career at a community college and then transfer to a four-year institution. For community college students to be successful as a transfer student at a four year university indicators of college preparedness for success at the university must be determined and an action plan established to ensure persistence and degree attainment. Community college
should use the same process as the K-12 educators to identify strategies and infrastructures in determining the indicators of college success and attainment. Community college should develop strategies and indicators of intervention that include; core completion; “gate keeping” courses of math, science and English; support systems for students at-risk of dropping out; and student transfer (EMCC, 2001).

Data Driven Data Decision Making (DDDM)

Designing innovative solutions to accelerate improvement of student postsecondary success continues to be the vision for the nation’s federal, state, and local governments and agencies. In an era of student-centered accountability and success for all students literally means the school is accountable to ensuring each individual student the essential knowledge and skills for success after graduation (Lachat, 2002). Data driven decision making in education can be traced as early as the 1970s. Researchers, Marsh, Pane, and Hamilton (2006) and David Conley (2010) hold that the No Child Left Behind (NCLB) legislation opened doors for opportunities and incentives for schools to use data for analysis to improve test scores, but did not necessarily provide students with the skills and knowledge for success beyond high school.

Current literature is mostly descriptive and does not report on the effects of DDDM and student learning outcomes. Bernhardt (1998) believes “what separates successful schools from those that will not be successful in their school reform efforts is the use of one, often neglected, essential element – data” (as cited in Lachat, 2002, p12). Other educators, Killion and Bellamy (2000), also support Bernhardt’s view of the
importance of understanding data as the key to school improvement. Data should be considered tools to inform quality decisions for school improvement on achievement, curriculum, professional development, instruction and remediation.

Predictive Data Growth Models

Education systems and states have been successful in the past few years in collecting data and building longitudinal data systems, but a warehouse of data does not improve student performance or college ready. For student performance to improve, an effort promoting capacity building by equipping educators to understand how to access, analyze and interpret data is one way of guiding continuous improvement in instructional strategies for student academic growth and achievement. The Data Quality Campaign (2009) identified three overarching imperatives for using longitudinal data to change education:

1. Expand the ability of state longitudinal data systems to link across the P-20 education pipeline and state agencies.
2. Ensure data can be accessed, analyzed, and used to communicate information found in the data to all stakeholders
3. Build the capacity of all stakeholders to use longitudinal data for decision-making.

State policymakers, educators, and education reform organizations understand that data sources and value-added analysis implementation into schools to guide the decision-making for improvement in instruction is a vital component to empowering all students the opportunity to reach their full academic potential (Battelle for Kids, 2010: Massell, 2000).

Simultaneously, K-20 education reform and accountability are terms discussed
within the same conversation in relationship to improving teaching and learning for student academic growth. NCLB stressed the education’s accountability around the state high-stakes assessment not success beyond high school. This pressure has caused many administrators and teachers to focus to passing the test rather than in preparing students with the necessary skills for success after graduation. Conley (2010), with the Center for Educational Policy Research, conducted a study in 2003 found most high school exit level exams are not aligned with post-secondary learning expectations or the skills to succeed in an entry level college course. Even with research available, high school administrators and teachers continue to prepare for state exit exams than using available data to align learning and identify strategies for post-secondary success. The challenge of many K-12 administrators is that they do not know what to do with vast amount of data to improve student learning and outcomes. Limited research is available on data models predicting college readiness for the classroom.

Studies indicate that many states and school districts are choosing value-added assessment data systems using students’ test scores to determine a student’s growth during a school year in an attempt to ensure a school meets federal annually yearly progress (AYP) requirement (Sawyer, 2008; Hershberg, 2007; Boudett, City & Murnane, 2007). The Oregon Department of Education (ODE; 2010) defines student growth as the measurement of student learning from the results of the state assessment in reading and math. One school district administrator in Oregon commented, “At its best, data should be more than a number. It should tell stories. Measure capacity. Create, in a sense, a living picture in order to see the school and the system in a different way.
Present the everyday in a precise and meaningful way” (Foley, Mishook, Thompson, Kubiak, Supovitz, Rhude-Faust, n.d., p.1). The right management information system allows for schools and classroom teachers to use available data to track student progress of learning and understanding. Data models are being constructed in an effort to improve student achievement and success. School districts in an effort to effectively use data to drive decisions have built longitudinal data systems which are either growth or value-added models.

Value-added models (VAM) are a method of analyzing student test data to measure teaching and learning. A VAM data system focuses on measuring teacher accountability as it impacts student learning outcomes using multiple years of existing students’ tests scores. VAM is not a test, but a way to determine whether students are making adequate growth each year. In tracking progress, the VAM allows for an opportunity of interventions (sense making) to bridge the gap when unintended outcomes occur (Dervin, 1992). VAM currently is often used by school districts to measure teacher performance. In addition, value-added analysis provides educators with diagnostic information to determine the impact of instructional practices on students’ growth across academic years. The data from VAM drive the instructional practices for many teachers and schools (Hershberg, 2007; McCaffrey, Lockwood, Koretz, & Hamilton, 2003). The use of growth and value-add models have advantages and disadvantages. These models can work for evaluating programs within a school the effectiveness of the school, and identifying schools with best practices. Literature reveals these models do not have the capability to inform instruction using a cohort-to-cohort approach. Another disadvantage of these models are their limit ability to provide
meaningful data to teachers to use for the current class to predict whether the students are on track as college ready since the data consist of last year’s assessment from the previous cohort (Ligon, 2008; Boudett, City & Murnane, 2007).

A pioneer of data models systems started in the early 1990s with the Tennessee value-added assessment system (TVAAS), a mix-model statistical method, was created by William Sanders, a statistician from University of Tennessee, to align education legislation in an effort to improve educational opportunities for students and teacher accountability in Tennessee. Studies of TVAAS present findings of a correlation between teachers being a dominant influence on student achievement and growth using this mixed-model methodology (Sanders & Horn, 1998).

Building on the early research of Sander’s TVAAS, SAS Institute has created a Web-based software product; EVAAS (Education Value-Added Assessment). The EVAAS design incorporates a multivariate, longitudinal, linear model that uses a minimum of three prior tests to predict student and classroom growth within a year as well as future success (SAS, 2010; Sanders, 2006). This is one of the largest longitudinal databases compiled of student, teacher, school, and district information solely for the purpose of determining the district, campus and teacher effects on the academic growth of students. Many school leaders have found the reports to provide the needed data for curriculum planning, differentiation instruction and program evaluation (Sanders & Horn, 1998; Wright, Horn & Sander, 1997). SAS EVAAS believes their product provides the value-added metrics for schools to track students’ academic growth and predict future opportunities for growth even in the postsecondary realm (SAS et al., 2010).
Ponisciak and Byrk (2004) discussed the concern of value-added models inability to link individual teachers to a student’s academic progress. Weiner (2004) with Education Trust in Florida and California showed growth models are not closing the achievement gap, but instead are actually causing more of a gap. Other limitations of value-added growth models, according to Davison (2004), are that the performance standards are not linked to students who may achieve one year’s worth of growth and still not achieve a performance standard for that year. Davison questions whether or not students who start out more than one year behind academically, that these models may not show growth within that time limitation. VAM have currently been unable to prove whether longitudinal data directly link performance standards to student growth and evaluation.

Theoretical Framework

The review of literature presents the reader with an understanding of the importance of using educational data systems to make informed decisions concerning individual student information targeting graduation and college readiness intervention indicators. Innovative schools support the systematic data use to develop intervention plans to improve student performance (Supovitz, & Klein, 2003). After a review of the literature, I determined that Dervin’s (1983, 1992) sense-making theory provides the basis for the theoretical framework of the study. Dervin’s model views information behavior in terms of a situation, a gap and an outcome, with information being used to bridge the gap and achieve the outcomes which are common place in school systems. Sense-making theory refers to the way of thinking about and implementing connecting
research and practice and the design of communication-based systems and activities to inform practice (Dervin, 2005). Dervin’s model (1983/1992) helps the user to know how to make sense of the information when an obstacle or gap (the distance between the problem and the solution) occurs. Within organizations, the sense making theory utilizes an understanding of the meaning of a concept and uses the knowledge to create an action plan for improving performance or product design. During the decision making phase, the understanding and knowledge are focused on selecting a strategic action plan which the organization commits to implementation.

The assumption of information seeking in the early work of Dervin’s (1999) model concentrated primarily on the importance of communication practices of researching information needs and uses. This theory describes the gaps exist in the information due to internal and external variables of communication and human involvement in the approach. Dervin considers the redesign of communication protocols and systems to better serve human beings has given sense making a descriptor of a critical methodology. Using the information seeking and use studies, the researcher must realize the study could produce either positive or negative outcomes which assist in designing an action plan.

Many researchers provide theories supporting the study of determining the early warning indicators of college readiness to success in college. Senge’s (2006) learning organizational theory and how it relates to data decision making and school improvement has relevance to this study (Marsh, Pane & Hamilton, 2006). Victor Vroom’s expectancy theory (Miner, 2005) suggests that an individual’s performance is based on individual factors such as personality, skills, knowledge, experience and
abilities (Miner, 2005). Vroom’s theory would apply to this study from the perspective that if students set aspirations for college understanding the end of result of a college degree could be the motivational factor for college success. Students often pursue college only when they believe they will encounter success in the experience. In reviewing different theories, Dervin’s sense making theory best aligns with my studying in determining the indicators of college readiness and success. According to Dervin’s sense making theory (1999; 1992), it supports the importance of understanding the organizational decision making process and the value of incorporating the communication aspect in bridging the informational gap to create an action plan for improvement. DCAT™ provides the communication piece to teachers for providing the interventions to the individual student to keep them on target for college preparedness and success.

Data Comprehensive Analysis Tool (DCAT™)

Most education reform initiatives support the perspective to improve academic achievement and college preparedness requires having a comprehensive data system capacity to collect and analyze meaningful student data. For students to experience a seamless transition from middle school to high school to post-secondary training, education school systems need not be by chance, but by design of an early warning alert data system for student success to ensure for interventions and safety nets are in place. The challenge that continues to face schools is determining which data elements predict student college readiness and success. Ensuring that students are on target for college success requires tracking student’s progress from P-16 for a seamless
transition. Longitudinal data systems allow for identifying schools in need of academic interventions early offering more time for increasing academic skills prior to graduation (ACT, 2008a).

Current data models utilized at school campuses apply data from the previous year which limits the accuracy of the information. The Data Comprehensive Analysis Tool (DCAT™) provides timely and accurate information on individual student progress throughout the current school year. The data provide teachers the needed information to implement interventions continuously to ensure the student remains on target for postsecondary success. The real time data provided by DCAT™ allow the student and teacher to know whether they are meeting the targets without having to wait for the end of the year state mandated assessments. To measure growth, DCAT™ is based on a growth mixture modeling. Implementation of a growth model method within a school allows for tracking of a student’s performance over a period of time (ODE, 2010).

According to Feldman and Rabe-Hesketh (2009), growth curve modeling has become the trend in education research with longitudinal data to track interventions and the effects on the progress of students and schools. Earlier researchers such as Bryk and Raudenbush (1992) and Meredith and Tisak (1990); Rogosa, Brandt, and Zimowski (1982) has advocated the use of growth curve models in studying the development human behavior in relation to the intra-individual difference changes.

The validity of the DCAT™ model has been tested in the state of Arkansas in predicting performance on state tests based on three years of historical 8th grade mathematical data. The model predicted performance on the state test with greater than 96% accuracy. DCAT™ is a user-friendly tool that brings complex statistical methods
into classrooms, schools, and districts in such a manner that individual student data are actionable and teacher interventions become timely (Byrd, 2009). Implementation of the DCAT™ using the identifiable indicators in the classrooms would allow teachers to use the information to ensure that all students are on target for post-secondary success in near real-time. However, the DCAT is still in its infancy and has not been validated in determining post-secondary readiness.

Literature Summary

Patte Barth, (2003), said, “In the business world, there is little doubt that the skills needed for success in work and in college are now converging.” For students to graduate with the necessary skills for success in college, schools need to incorporate data plans focused on improvement of individual student achievement. Dervin’s theory (1999; 1992), supports the importance of understanding the organizational decision making process and the value of incorporating the communication aspect in bridging the informational gap to create an action plan for improvement According to Conley (2010), states should focus on developing statewide data systems aligned between secondary and post-secondary systems for a more seamless flow of data information. When developing a school-wide data improvement plan, administrators should consider Christopher B. Swanson, an Urban Institute researcher, criteria for ensuring the collection of high quality data and reporting to include: uniformity, accuracy, transparency, and accountability (NGA, 2005). The literature review in this study supports the viewpoint that public education needs to use quality data to identify strategies targeting improvement of student achievement for post-secondary success.
CHAPTER 3

METHODOLOGY

The literature supports a need for identifying early warning indicators of college readiness of middle school and high school students for them to experience access, future college success. A causal-comparative design using multiple regression analysis was employed to study the early warning indicators of college readiness. According to Gay (1996), causal-comparative research compares two groups using conditions that already exist to determine reasons for the phenomenon being studied. The current study determines the effect of existing variables that impact a student’s college GPA between two early college high schools.

Participants

The participants included 134 students enrolled in Grades 9-12 who participated in the early college high school program. The rationale for choosing students enrolled in the early college high school program is based on the availability of data from both high school and college transcripts. The early college high school program is a bold approach, based on the principle that academic rigor, combined with the opportunity to save time and money, is a powerful motivator for students to work hard and meet serious intellectual challenges. Early college high schools blend high school and college in a rigorous yet supportive program, compressing the time it takes to complete a high school diploma and the first two years of college with students enrolled in both high school and college courses simultaneously. The demographic composition of the participants in the current study will include minority students (more than 80% Hispanic)
who are from low socio-economic backgrounds (approximately 65% enrolled in the free and reduced meals program). Regarding student demographics, the majority of participants were female (more than 65%). Further the ethnic distribution included African Americans 1.7 % in School A and 13.2% in School B; American Indian 1.3% in School B; Asian 5.2% in School A; Hispanics 87.9% in School A and 84.2% in School B; and White 5.2% in School A and 1.3% in School B.

Table 1

*Demographic Description of Students in School A and B*

<table>
<thead>
<tr>
<th>Variable</th>
<th>School A</th>
<th>School B</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Percent</td>
<td>Frequency</td>
<td>Percent</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>20</td>
<td>34.5</td>
<td>21</td>
<td>27.6</td>
</tr>
<tr>
<td>Female</td>
<td>38</td>
<td>65.5</td>
<td>55</td>
<td>72.4</td>
</tr>
<tr>
<td>Ethnicity/Race</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>51</td>
<td>87.9</td>
<td>64</td>
<td>84.2</td>
</tr>
<tr>
<td>African American</td>
<td>1</td>
<td>1.7</td>
<td>10</td>
<td>13.2</td>
</tr>
<tr>
<td>White</td>
<td>3</td>
<td>5.2</td>
<td>1</td>
<td>1.3</td>
</tr>
<tr>
<td>American Indian</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1.3</td>
</tr>
<tr>
<td>Asian</td>
<td>3</td>
<td>5.2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Socioeconomic Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>38</td>
<td>65.5</td>
<td>58</td>
<td>76.3</td>
</tr>
<tr>
<td>High</td>
<td>20</td>
<td>34.5</td>
<td>18</td>
<td>23.7</td>
</tr>
</tbody>
</table>

The data for the study were provided by the Texas High School Project. The Texas High School Project (THSP) is a public-private alliance dedicated to significantly improving the postsecondary readiness of low-income students with a focus on students in low performing schools. THSP leverages the expertise and resources of its public and private partners to ensure all Texas students have the opportunity to graduate high school ready for college success, and are prepared to contribute to their communities. Working directly with schools districts, policymakers, and our partners in the public and
private sector, THSP fosters a dynamic collaboration to bring about innovative ways of improving our schools. Applying practical insights and proven solutions, THSP significantly impacts the transition from middle school through high school and into postsecondary success, concentrating on four key impact areas: teacher effectiveness; learning systems; education leadership; and performance management (THSP, 2010). The early college high school data are self-reported from the individual high school and college campuses.

Dependent Variable

The dependent variable was the participant’s grade point average (GPA) at the completion of their first year enrolled in college. GPA is a continuous variable based on a 4.0 scale.

Independent Variables

The independent variables include the following:

- Texas Assessment of Knowledge and Skills (TAKS) results in math and reading from Grades 9, 10, and 11. The TAKS is a comprehensive testing program for public school students in Grades 3-11. The TAKS is designed to measure to what extent a student has learned, understood, and is able to apply the concepts and skills expected at each tested grade level (TEA, 2009).
- Year-end averages in core high school courses (math, science, English, and history) from Grades 9-12.
• Scores on college entrance exams (SAT/ACT) were considered for the study, but due to lack of availability of the scores, these results were not included in this study.

• Attendance - Measured as the number of days absent each year (Grades 9-12).

Procedures/Data Analysis

The early college high school data files were obtained from the Texas High School Project’s research and evaluation department. Permission for data use was granted by the Texas High School Project) and which had been collected previously by the early college high school program’s data team.

Initially, individual student-level data were obtained from early college high schools on students who have completed Grades 9-12. The rationale for including only those students who have completed Grades 9-12 is to ensure that I have a comprehensive dataset that includes each of the variables discussed above.

Subsequently, the data were entered into statistical software SPSS® 18.0 and descriptive analyses conducted. The purpose of the descriptive analyses was to check for erroneous entries and examine the data to determine the distribution of the data, which is necessary prior to fitting statistical models.

Next, the math and reading TAKS scaled scores were converted to standard z-scores prior to fitting growth models. The reason for converting the TAKS scaled scores to standard z-scores is that the TAKS scaled scores are not designed to measure growth from year to year. Converting to z-scores places the scores in a different metric which can then be utilized in a growth model. This method is commonly used by the
Texas Education Agency as a measure of growth in math and reading across years. Once the TAKS scores are converted to z-scores, a growth model was calculated with the intercept and slope retained for each participant.

Regression models were calculated (via SPSS) to determine which variables were indicative of successful performance in college courses during the participants' first year of enrollment. In addition, the intention of the study was to use of the DCAT™ reporting tool, to determine points of intervention that could be used by classroom teachers to alter instruction to ensure that all students graduate college ready. The only assessment data provided by the early college high schools were their TAKS scores for Grades 9-11. In order for DCAT™ to be used as a reporting mechanism, it requires a minimum of three formative assessments within the same school year. For this reason, DCAT™ was not utilized within the study.
CHAPTER 4

RESULTS

This chapter presents the findings of the study designed to address the research question: What are the early warning indicators of college success among early college high school students at selected Texas institutions of higher education? The findings are presented in five descriptive statistic tables regarding students’ achievement and demographic data. Tables 6 and 7 include the correlation results between the student’s college GPA and attendance, student performance in core academic courses, and growth in TAKS math and reading assessments. Next, this chapter discusses the regression analysis in Tables 8 and 9 to determine which variables were indicative of successful performance in college courses during the participants’ first year of enrollment.

Descriptive Statistics

Prior to analyses, all variables in the study were examined through statistical software SPSS® 18.0 for accuracy of data entry. The descriptive analysis was conducted to determine the mean and standard deviation of all variables in the study. Data consisted of the complete high school and college transcript of every 2010 early college high school graduate from two state Texas high schools.

Descriptive analyses provided a basic description of the data sets and a summary of the sample population and measures. The variables explained through the descriptive statistics included year-end averages and standard deviations of high school core subjects, which include: English I, English II, English III, English IV, Algebra I,
Algebra II, geometry, biology, chemistry, physics, world history, and world geography; TAKS math and reading scores; and high school and college credits.

For this study, Table 2 illustrates the results of the students’ year-end averages in core high school courses (English, math, science and history). In addition in this study, a student earning a 2.5 grade average in a course has been determined as an element of college readiness (Nagaoka, Rocerick & Coca, 2009; ACT, 2007). Table 2 results reveal the students’ average for each of the core subjects in school A to be above 2.5 with exceptions of Algebra I ($M = 2.27$, $SD = .66$), Algebra II ($M = 1.89$, $SD = 1.11$), and physics ($M = 2.08$, $SD = .94$). School B’s results showed these students to maintain a 2.5 average in all subject areas except chemistry ($M = 2.25$, $SD = .41$) and geometry ($M = 2.49$, $SD = .70$). In addition, School A performed well in maintaining higher than a 2.7 in the humanities courses: English I ($M = 3.18$, $SD = .43$); English II ($M = 3.11$, $SD = .65$); English III ($M = 2.70$, $SD = 1.00$); English IV ($M = 2.78$, $SD = .77$); world geography ($M = 3.42$, $SD = .55$); and world history ($M = 2.77$, $SD = .79$). Furthermore, School B achieved a 2.7 in all humanities courses except English II ($M = 2.66$, $SD = .55$). Table 2 indicates math and science courses to be lower overall than the humanities courses.

Hispanic students, who make up more than 80% of the population in both schools, tended to have a higher overall average in core courses than African American students. American Indian, Asian, and white students were excluded in the analyses due to less than ten students in each of these sub-populations. When reviewing the average year-end grades of core high school courses and the ethnicity within School A, Hispanics students fell below the 2.5 average only in Algebra II and physics.
Table 2

**Descriptive Statistics of High School Core Subjects**

<table>
<thead>
<tr>
<th></th>
<th>School A</th>
<th></th>
<th>School B</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>Mean</td>
<td>SD</td>
<td>n</td>
</tr>
<tr>
<td><strong>English</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>English I</td>
<td>57</td>
<td>3.18</td>
<td>.43</td>
<td>76</td>
</tr>
<tr>
<td>English II</td>
<td>57</td>
<td>3.11</td>
<td>.65</td>
<td>76</td>
</tr>
<tr>
<td>English III</td>
<td>58</td>
<td>2.70</td>
<td>1.00</td>
<td>76</td>
</tr>
<tr>
<td>English IV</td>
<td>45</td>
<td>2.78</td>
<td>.77</td>
<td>76</td>
</tr>
<tr>
<td><strong>Math</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Algebra I</td>
<td>47</td>
<td>2.27</td>
<td>.66</td>
<td>75</td>
</tr>
<tr>
<td>Geometry</td>
<td>56</td>
<td>2.93</td>
<td>.73</td>
<td>76</td>
</tr>
<tr>
<td>Algebra II</td>
<td>48</td>
<td>1.89</td>
<td>1.11</td>
<td>76</td>
</tr>
<tr>
<td><strong>Science</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biology</td>
<td>57</td>
<td>3.42</td>
<td>.55</td>
<td>76</td>
</tr>
<tr>
<td>Chemistry</td>
<td>57</td>
<td>2.61</td>
<td>.83</td>
<td>76</td>
</tr>
<tr>
<td>Physics</td>
<td>58</td>
<td>2.08</td>
<td>.94</td>
<td>76</td>
</tr>
<tr>
<td><strong>Social Studies</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>World Geography</td>
<td>57</td>
<td>3.42</td>
<td>.55</td>
<td>76</td>
</tr>
<tr>
<td>World History</td>
<td>57</td>
<td>2.77</td>
<td>.79</td>
<td>76</td>
</tr>
</tbody>
</table>

In School B Hispanic students’ mean averages dropped below 2.5 in geometry ($M = 2.44, \ SD = .66$) and biology ($M = 2.30, \ SD = .43$). The ten African American students in school B reported a lower average in math and science courses, geometry ($M = 1.75, \ SD = .35$), Algebra II ($M = 2.25, \ SD = .35$), chemistry ($M = 2.15, \ SD = .38$), biology ($M = 2.35, \ SD = .41$) and physics ($M = 2.25, \ SD = 42$) compared to the sixty-four Hispanic students in School B.

In addition the results showed that a student’s socioeconomic status does not appear to impact the student’s ability to maintain a 2.5 average in English and social studies courses. Students in both socioeconomic categories performed lower in their
math and science courses. School A’s students with higher economic status performed at a lower level than the lower socioeconomic students. This finding was manifested in Algebra I ($M = 2.28, SD = .66$), Algebra II ($M = 1.97, SD = 1.10$), chemistry ($M = 2.48, SD = .95$), and physics ($M = 2.05, SD = .99$).

In reviewing the comparisons among male and female students’ year-end averages in core high school courses, there was little. School A showed a nominal difference between male and females with a variance of only .29 with the exception of pre-calculus where males had a mean of 3.63 ($SD = .48$) and females mean was 2.64 ($SD = .75$). At School A, year-end averages were above 2.5 in the core high school subjects, except Algebra II for males ($M = 1.81, SD = .63$) and females ($M = 1.93, SD = 2.18$) and physics for both males ($M = 2.13, SD = 1.22$) and females ($M = 2.05, SD = .85$). In contrast, males and females at School B were below the 2.5 year-end average threshold in more math and science courses. Subjects where females scored below a 2.5 average included geometry ($M = 2.47, SD = .71$), biology ($M = 2.3, SD = .412$), and chemistry ($M = 2.27, SD = .48$), while subjects in which male students scored below the 2.5 threshold included biology ($M = 2.36, SD = .48$) and chemistry ($M = 2.19, SD = .37$).

Table 3 describes both cumulative high school and college credits and GPA. Texas high school graduation requirements were 24 credits for both schools. Overall, students in School A earned 2.68 more high school credits than School B. However, with a 2.5 year end average the high school GPA, for both campuses met the threshold of college readiness by maintaining a year-end average of 2.5. In fact, the high school GPA mean for both schools was 2.9. Consequently, the gender and socioeconomic variables in both schools did not impact the results.
Table 3

*Descriptive Statistics High School and College Cumulative College GPA and Credits*

<table>
<thead>
<tr>
<th></th>
<th>School A</th>
<th></th>
<th></th>
<th>School B</th>
<th></th>
<th></th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td>N</td>
<td>M</td>
<td>SD</td>
<td>N</td>
<td>M</td>
</tr>
<tr>
<td>High School Cumulative GPA</td>
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<td>47</td>
<td>2.90</td>
<td>5.90</td>
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<td>2.91</td>
</tr>
<tr>
<td>High School Cumulative Credits</td>
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<td>47</td>
<td>27.40</td>
<td>2.30</td>
<td>76</td>
<td>24.72</td>
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<tr>
<td>College Cumulative GPA</td>
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<td>58</td>
<td>2.67</td>
<td>.67</td>
<td>76</td>
<td>2.84</td>
</tr>
<tr>
<td>College Cumulative Credits</td>
<td></td>
<td>58</td>
<td>49.34</td>
<td>17.71</td>
<td>76</td>
<td>67.70</td>
</tr>
</tbody>
</table>

In addition both School A and B’s cumulative college credits exceeded 42, and the average cumulative college GPA was above a 2.5 for their initial year of college. There was only a .17 difference between School A’s and School B’s cumulative college GPA. Regarding gender, both male and female students maintained a college GPA average above 2.5 and earned more than 42 college credits upon graduating from an early college high school. Further Table 3 shows overall ethnicity to not be a factor influencing the student’s college GPA except in School B, where African American students’ college GPA was lower than 2.5 ($M = 2.43$, $SD = .50$), but that did not affect their number of college credits completed ($M = 56.90$, $SD = 13.46$).

Table 4 illustrates both schools’ Texas Assessment of Knowledge and Skills (TAKS) assessments in English and math for a three year span. Both schools average TAKS performance exceeded the state standard score of 2100 for the English and math assessments. The Texas Education Agency recognizes a scale score of 2200 or higher on the English or math Exit level assessment as measure of college readiness. On average, students from Schools A and B exceeded the scale score of 2200. School A
showed to perform at a lower level compared to school B in math all three years, 2006 ($M = 2227.64, SD = 165.90$), 2007 ($M = 2218.59, SD = 198.03$), 2008 ($M = 2272.86, SD = 240.51$).

Table 4

*Descriptive Statistics of TAKS Assessment Data*

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Table 5 shows the average attendance for each campus for the four years of high school. School A’s campus absentee average was higher each year than School B. In the 2008-2009 school year, the students’ junior year, the highest absentee average for both schools occurred. The campus absentee rate for School A was an average of 9.31 days ($SD = 7.38$) for the school year compared to School B’s absentee rate of an average of 3.61 days ($SD = 4.93$).
Correlation Results

Pearson product-moment correlations were conducted to determine the relationship among the variables in the study. According to Cohen (1988), correlations in absolute value between .00 and .30 are considered to be small; .31 and .50 to be moderate; and .51 to 1.00 to be large (Cohen, 1988).

Tables 6 and 7 depict the correlation results of Schools A and B between college GPA, student attendance, student performance in core academic courses and growth in TAKS math and reading assessments over a three year timeframe. The correlation results from School A ranged from $r = -.106$ for attendance in 10th grade in 2007-2008 correlated with cumulative college GPA to $r = .658$ for English IV when correlated with cumulative college GPA. In School B, the correlations ranged from $r = -.098$ for attendance in 10th grade in 2007-2008 when correlated with cumulative college GPA to $r = .747$ for English I when correlated with cumulative college GPA. Correlations with attendance in both schools were low in magnitude and shared no statistically significant
relationship to college GPA. Growth in TAKS reading and math assessments over the three-year timeframe in School B revealed a low statistically significant relationship with the dependent variable \( r = .042 \), while in school A the TAKS math growth showed a moderate relationship with students’ college GPA \( r = .416 \). All high school core content courses had moderately strong positive correlations with the college GPA with correlations ranging in School A from \( r = .305 \) in English I to \( r = .658 \) in English IV and School B from \( r = .279 \) in Chemistry to \( r = .747 \) in English I. English courses in both schools appeared to share the highest statistically significant correlations to a students’ college GPA.

Other significant correlations were found between math courses and their significant major correlation to the college GPA in both schools. Math courses in both schools were found to be the largest significant correlation for School A Algebra II of \( r = .567 \) and School B geometry of \( r = .609 \). The one variable with the greatest difference in correlation range was Chemistry at School A’s large correlation of \( r = .529 \) compared to School B’s not existence of a correlation \( r = .279 \) where as English III and IV showed a relatively strong relationship to the student’s college GPA in both schools. School A reported a correlation of .649 for English III and .658 for English IV. School B’s correlation results were English III \( r = .624 \) and English IV \( r = .595 \).
### Table 6

**Correlation Results of College Success for School A**

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<th>Chemistry Average</th>
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**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).
### Table 7

**Correlation Results of College Success for School B**

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</tr>
<tr>
<td>World History Average</td>
<td>.622</td>
<td>- .005</td>
<td>- .174</td>
<td>- .003</td>
<td>- .114</td>
<td>.658**</td>
<td>.694**</td>
<td>.528**</td>
<td>.559**</td>
<td>.479**</td>
<td>.506**</td>
<td>.604**</td>
<td>.651**</td>
<td>.392**</td>
<td>.639**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>World Geography Average</td>
<td>.576**</td>
<td>- .196</td>
<td>- .185</td>
<td>.088</td>
<td>- .071</td>
<td>.592**</td>
<td>.622**</td>
<td>.464**</td>
<td>.560**</td>
<td>.512**</td>
<td>.368**</td>
<td>.446**</td>
<td>.625**</td>
<td>.274**</td>
<td>.545**</td>
<td>.716**</td>
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<tr>
<td>TAKS Reading Growth</td>
<td>.184</td>
<td>- .154</td>
<td>.063</td>
<td>- .016</td>
<td>- .221</td>
<td>.183</td>
<td>.101</td>
<td>.148</td>
<td>.120</td>
<td>.029</td>
<td>.225</td>
<td>.011</td>
<td>.076</td>
<td>.172</td>
<td>.307**</td>
<td>.205</td>
<td>.111</td>
<td>.067</td>
<td>1.00</td>
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</table>

** Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).
Regression Analysis

Multiple regression was utilized as an advanced statistical analysis. Multiple regression assesses how the independent variables work together to determine the variance of the dependent variable and allows the researcher to learn more about the relationship between several independent variables and the variable (Statsoft Electronic Text book, 2008). Multiple regression in this study identified how much of the variance in the college GPA can be explained by attendance, growth in TAKS math and reading scores over a three year timeframe, and year end grade averages in English, math, social studies, and science.

After reviewing all the dependent variables that included attendance, TAKS English and math growth scores, and other content courses, in depth analyses revealed that the best indicators of college success (maintaining a 2.5 GPA during the initial year in college) included Algebra I and world history. Table 8 displays a College Readiness Predictor Regression model that used numeric form of cumulative college GPA as the dependent (criterion) variable. This analysis was conducted using SPSS© 18. The multiple regression was conducted to quantify the relationship between the dependent variable, the college GPA, and the independent (predictor) variables, attendance, year-end averages of high school core courses and TAKS reading and math growth scores. An adjusted $R$ squared value measured the proportion of the variance of the criterion variable, college GPA that could be explained by the predictor variables. $R$ squared is a measure of how good a prediction the criterion variable can be made by knowing the independent variables (Brace, Kemp, & Sneglar, 2006).
As a result of regression analysis, it was found that the two indicators variables to affect the college GPA in School A were Algebra I and world history. The $R$ square of Algebra I accounts for approximately 23% of the variance in college GPA while world history explained 15% of the variance of the outcome variable (college GPA). The adjusted $R$ square value of .380 indicates about 38% overall spread of the variance in the college GPA in School A can be explained by the model. Further analysis using logistic regression revealed that students in School A who maintain a 2.8 GPA average in Algebra I are 4.65 times more likely to maintain a 2.5 or higher college GPA. Further, results revealed that every one point increase in Algebra I GPA was associated with a .345 increase in college GPA. The overall model was significant ($f = 14.51, df = 2, 42, p = <.001$).

Table 8

*Multiple Regression Model of College Readiness Indicators in School A*

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
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<td>1</td>
<td>.639$^a$</td>
<td>.409</td>
<td>.380</td>
<td>.48790</td>
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</table>

$^a$Predictors: (Constant), World History, Algebra I

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients B</th>
<th>Std. Error</th>
<th>Standardized Coefficients Beta</th>
<th>t</th>
<th>Sig.</th>
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</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>1.091</td>
<td>.251</td>
<td></td>
<td>4.347</td>
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<tr>
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<td>.470</td>
<td>.083</td>
<td>.549</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Algebra I</td>
<td>.202</td>
<td>.101</td>
<td>.194</td>
<td>.048</td>
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</table>

$^a$Dependent Variable: College Cumulative GPA
In this study the regression model used with School A to predict college success was replicated at School B, Algebra I and world history were found to be statistically significant indicators of future college success, explaining approximately $40\%$ of the variance in college GPA ($R = .644$). Algebra I accounted for $15.2\%$ and world history accounted for $26.3\%$ of the variance in the outcome variable (college GPA). Further analysis using logistic regression revealed that if students in School B make an A or B in Algebra I, according to these results they are 10 times more apt to be ready and have a $78\%$ chance of maintaining a 2.5 or better college GPA versus students making a C or D which reduces their chances to $26\%$. The overall model was significant ($f = 25.55$, $df = 2, 72$, $p < .001$).

Table 9

*Multiple Regression Model of College Readiness Indicators in School B*

<table>
<thead>
<tr>
<th>Model Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Model</strong></td>
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<td>1</td>
</tr>
</tbody>
</table>

$^a$Predictors: (Constant), Algebra I, World History

<table>
<thead>
<tr>
<th>Coefficients$^a$</th>
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<tbody>
<tr>
<td><strong>Model</strong></td>
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<tr>
<td></td>
</tr>
<tr>
<td>(Constant)</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

$^a$Dependent Variable: College Cumulative GPA
DCAT™ Reporting Tool

The DCAT™ growth model provides teachers and administrators timely and accurate information on individual student progress throughout the school year using formative assessments in determining indicators of post-secondary readiness. The initial plan of this study was to use the DCAT™ as a reporting mechanism to determine indicators of whether a student was on target for post-secondary success over time. The DCAT™ model requires the use of a minimum of three formative assessments within the same school year of a student. As a result this reporting tool was not used for this study because the only available assessment was the TAKS and the TAKS growth scores of theses participants showed not to be significant indicators of college success.

Conclusion

The regression analysis findings from this study showed that, of the variables analyzed (reading and math TAKS, year-end averages of English, math science, and socials studies courses and attendance) Algebra I and world history were the strongest indicators of college success to maintain a 2.5 college GPA during the initial year of college. In addition the descriptive statistics showed the participants’ gender, ethnicity, or socioeconomic status are not variables affecting the college GPA. Next the correlation results in this study found a significant correlation between math courses and the college GPA for both early college high schools. However, the correlation between attendance and TAKS growth and the college GPA was statistically low significance between attendance and TAKS growth and the college GPA.
CHAPTER 5

DISCUSSION OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This chapter presents a discussion of the findings and presents conclusions and recommendations for future research. Conclusions and recommendations are based on the results from the study.

Discussion of Findings

Realizing our nation is in a college-readiness crisis, many education reform efforts have embedded high school strategies targeting student achievement and college preparedness in efforts to increase college success behaviors. This study was a causal-comparative designed to determine early warning indicators of college success among early college high school graduates. Furthermore for this study, a college GPA of 2.5 or higher was the cut score used in determining college success which corroborates with studies showing that students with a GPA above 2.5 future success in college (Nagaoka, Rocerick & Coca, 2009). Another report by the College Board (2008) found that if a student maintains a 2.7 high school GPA or higher increased their probability of maintaining a college GPA of 3.0 or better and completing their first year of college without developmental courses.

This study utilized archival data from the Texas High School Project. The participants for the study included of 134 high school graduates who participated in the early college high school program in the Dallas-Fort Worth area. The statistical methods used to achieve the purpose of this study were descriptive statistics, correlations, and regression models to examine the relationship between the dependent variable, college
GPA, and the independent variables TAKS reading and math scores from 9th, 10th, and 11th grade, year-end averages in high school core classes, and attendance.

The descriptive statistics, which included frequencies, percentages, means, and standard deviations, were used to look at the distribution of variables and check for erroneous entries. As a result of this study, it was found that gender, ethnicity and socioeconomic status variables in both early college high schools did not impact the college GPA. This aligns with the empirical study conducted by ACT (2008a) that found offering students an opportunity for rigorous curriculum in high school demonstrates to be of the single most proven factor of college success regardless of gender, ethnicity, and socioeconomic status.

Pearson product-moment correlations were conducted to determine the relationship among the variables in the study. According to this study, English courses in both schools appeared to share the highest statistically significant correlations to a students' college GPA. Even though in this study English was not identified as an indicator of college readiness, a plausible explanation could be attributed to the reading and understanding skills required in this subject which are the identical skills for world history. Another notable correlation was found between math courses and their significant major correlation to the college GPA for both early college high schools.

Multiple regression in this study identified how much of the variance in the college GPA can be explained by attendance, growth in TAKS math and reading scores over a three year timeframe, and year end grade averages in English, math, social studies, and science. After reviewing all the independent variables, in-depth analyses indicated grades in Algebra I and world history to be the strongest significant early
warning indicators of whether or not a student will maintain a 2.5 college GPA during the first year of college. This finding held true in both School A and School B. Based on the findings from this study, high school curriculum needs to focus on ensuring students have mastered the competencies in Algebra and world history to prepare them for future success in learning beyond high school.

The statistical analysis found a significant relationship between the college GPA and the high school courses Algebra I and world history to be the strongest indicators of college success, at the $p < .05$ level. Math courses in both schools were found to be the largest significant correlation with college GPA. At School A the highest correlation was with Algebra II grades and in School B with geometry grades. The overall regression model was significant ($f = 14.51$, $df = 2$, 42, $p = < .001$). According to Bowen, Chingos, and McPherson (2009), the best indicators of college success are the grades students receive in core high school course, English, math, science, and social studies. For students to be successfully prepared for life beyond high school, education reform movements need to understand the importance of a rigorous high school core curriculum (Conley, 2010). This study found that math and social studies were indicators of college success, but not English or science courses.

The regression analysis findings in the study indicated Algebra I to be a indicator of college success in both Schools A and B. According to the National Mathematics Advisory Panel (DOE, 2008b) stated, “Algebra is a demonstrable gateway to later achievement” and opens doors of opportunities for college options. In this study, School A’s corroborated this research. The $R$ squared value indicated about 38% of the variance in the college GPA in School A could be explained by the model which
included Algebra I scores. Dervin’s (1982) sense-making theory model, the framework for this study, recognizes the importance of understanding how the information helps the user make sense of a situation, highlights the role of information use. The findings from this study underscore the importance of Algebra I as an early indicator of potential college success. Further, the logistic regression analysis from this study found students in School A who maintain a 2.8 GPA average in Algebra I are 4.65 times more likely to retain a 2.5 or higher college GPA. The results from School A revealed that every one point increase in Algebra I GPA was associated with a .345 increase in college GPA. Further analysis using logistic regression revealed that if students in School B make an A or B in Algebra I, they are 10 times more apt to be college ready and have a 78% chance of maintaining a 2.5 or better college GPA versus students making a C or D which reduces their chances to 26%. Likewise, the Algebra I findings in the study of School A and B aligns with Edmonds (2010) experimental study which found that students not completing Algebra I by the end of the 9th grade year found it harder to complete college prep courses which significantly impacted their success in college.

From Edmond’s study, Algebra I is the foundation to analytical skills for upper math courses, could be considered an early indicator of college success since students take the course as early the 8th grade. David Conley (2007, 2005) refers to algebra as the building block and problem solving as the heart of success in college math. Furthermore, the Algebra I findings in the study of School A and B indicated that math continues to be an area of struggle for both male and females in School A and B. The data reveal that a gap exists between where the students are currently performing in
math and the intended predetermined outcome of an average GPA of 2.5 or greater in core high school courses.

Further, the results indicated there was a statistically significant relationship between the college GPA and the year-end average of the high school world history for both schools. The logistic regression analysis conducted in the study revealed the $R$ square of world history explained 15% of the variance of the outcome variable (college GPA) in School A. When replicating the logistic regression model for School B, world history accounted for 26.3% of the variance in the outcome variable (college GPA). One explanation of world history as an indicator of college readiness in this study could be that the course is more closely aligned to the Texas College and Career Readiness Standards (TCCRS) than other courses. The TCCRS states that for a student to succeed in college the student must possess knowledge and skills to dissect and analyze complex information. World history is a course that allows the students the opportunity to apply cognitive strategies such as reasoning, problem solving, and conducting research (Conley, 2010; THECB, 2008).

ACT (2006b) conducted a study that echoes the message that a rigorous social study curriculum in high school seems to have a positive relationship to a student’s success in college-entry level courses. The ACT study also suggested that the social science courses influence college-readiness was that course expectations focus on reading complex texts. Therefore, one explanation of the statistical significance of world history and college readiness in School A and B could possibly be attributed to the course sequence. Both early college high schools take high school world history
followed by the U.S. History dual credit course, which is one of the first entry-level college courses taken at both early college high schools.

The findings from this study indicated that exit level TAKS scores have no significant impact on students’ success in college. The state-mandated assessment, Texas Assessment of Knowledge and Skills (TAKS), has been adopted as the required measure for graduation from high school, but is not necessarily a good indicator of college preparedness. Conley (2010) has conducted extensive research around state-mandated assessments and college-readiness. As a result of his research, Conley has found that most state-mandated assessments were not aligned with postsecondary learning and success. The findings in this study were consistent with Conley’s results that the TAKS assessment is not a good indicator of college readiness due to the lack of alignment to post-secondary skills. Also, research shows institutions of higher education believe that state assessments measure basic skills levels that leave the student unprepared for entry-level college courses (Conley et al., 2010; ACT, 2005). Another study revealing the lack of alignment of state assessments and college readiness was conducted by ACT (2005). In this study, ACT found the percentage of 10th graders who passed the state assessment, but were not on track for college when they graduate from high school were 27% percent in English and 56% in math. Overall, both of the ECHS campuses scored exceptionally high on the TAKS exit level assessment exceeding the state standard score of 2100 required for high school graduation which could attribute to the schools’ focus on college readiness. In addition, both ECHS campuses graduated high school with an average of 42 college credits.
Implications for Practice

Researchers, March, Pane, and Hamilton (2006) and David Conley (2010) hold that the NCLB legislation opened doors for opportunities and incentives for schools to use data for analysis to improve student achievement and ensure all students graduate college ready.

Results for the research question presented suggested students who perform with a 2.5 year end average in Algebra I and world history are more apt to possess the necessary skills for success in college entry level courses. Although other factors can be linked to success beyond high school, the implications from this current study corroborates with the need for teachers to focus on students being successful in these courses by making a 2.5 or higher in the course not just passing the course. Strategic intervention plans need to be developed to target students who show signs of failure. For teachers to be able to make better instructional decisions requires using the right kind of data not just the state assessment data from the prior year.

The only available assessment for this study was the TAKS. Yet the TAKS growth scores were not found to be significant indicators of college GPA. This study revealed the TAKS data do not indicate whether a student has the necessary skills to be successful after high school and does not lend itself as a college readiness indicator to determine whether a student is on track or off track for post-secondary readiness. There have been some endeavors in the education realm to develop CCRS aligned formative assessments as the reform answer, but little to no action has occurred to implementation and design. If education reform is to occur, this requires educators to quit looking to the state-mandated assessments, such as TAKS, as the measurement of
a student’s success. If all students are to be college ready when they graduate from high school, the development of valid and reliable assessments is essential in collecting useful data. These assessments should include a minimum of three formative assessments during each year of high school for each subject based on CCRS, rigor and relevance. One suggestion might be Dervin’s (1992) sense-making theory. It is relevant in the context of school reform, and stipulates that the data that are used to bridge the gap between the situation and the outcome must be accurate and come from multiple sources.

Recommendations for practice from this study include investigating how the random effect growth model: on track/off track algorithm could work with a pilot school. This study, as well as research by Doran (2004) implores further study to investigate how value-added models can improve student performance and preparedness for learning beyond high school. As schools see the need to change to a data driven culture aligned with post-secondary skills, it becomes apparent that a different type of data is needed to make better instructional decisions to determine whether a student is on track or off track for post-secondary success. For a considerable cost, a school can track student’s scores based on statistical predictions and will be able to know whether each student is on track to pass TAKS and whether or not enough “value” has been added to ensure that all students are college-ready. These value-added programs focus on the type of data that teachers need in order to make instructional decisions for their classrooms. Using the Microsoft Excel program has the potential for the same results as a promising practice for a district that is unable to purchase an expensive value-add on track/off track data model. If the district’s data system allows teachers to export the
student data into Excel, a teacher has the potential to create an on track/off track reporting tool similar to reporting tool, DCAT™. Once the data are in Excel, the data can be analyzed and graphed in many ways to allow teachers to look at the right types of data in such a way to use and take action in their classroom to track whether the students will be successful to learn beyond high school (Conley, 2010).

Once individual growth trajectories and alignment of the assessments to post-secondary readiness are known, the on-track/off-track calculations provide the amount of growth needed to achieve the proposed outcome during the intended timeframe. The resulting solution then indicates whether the student is on-track to meet the goal of the proposed outcome of post-secondary readiness or if the teacher must intervene to ensure the student returns to a pathway of success.

Using an on or off track statistical formula, like the random-effect growth module (Figure 1) to target post-secondary readiness requires first the creation of valid and reliable assessments based on research practice and aligned to CCRS for each core

![Figure 1. Random-effect growth module: The on track/off track formula.](image-url)
high school course. Figure 1 illustrates the on track or off track formula, random-effect growth module. Using this formula allows a teacher to know which student requires interventions to ensure all students stay on track to be college ready at graduation.

The findings in this study of School A and B also considered non-cognitive characteristics, such as socioeconomic status, ethnicity, and gender, as indicators of college readiness. Research indicates that students who enroll in a rigorous high school core curriculum are more apt to be college prepared regardless of socioeconomic status, gender or ethnicity (ACT, 2008d). The findings from this study indicate that the socioeconomic status did not influence a student’s college GPA in either school studied. Several other studies support these same findings that the socioeconomic status of a student does not have significant impact on college GPA (Kirby, White, & Aruguete, 2007; LaCombe, 2007). ACT (2004b) conducted another study which found socioeconomic status did not have a strong relationship to the college GPA, but a strong relationship to retention. Further, ethnicity and gender were not a factor influencing the college GPA in this current study. However, additional studies by researchers Mattson (2007) and Patton (1998) focusing on non-cognitive characteristics influencing the college gender identified gender to be a significant indicator of college success. Further, the ethnicity of the students in these two early college high schools, predominantly Hispanic and African American, did not have a significant relationship to their college GPAs. The plausible explanation of the finding in the current study could be attributed to support systems that are prevalent in both of these ECHS programs. Support systems for the students are a core principle of all ECHS programs. Core Principle 4 states (JFF, 2008), “Early college schools engage all students in a
comprehensive support system that develops academic and social skills as well as the behaviors and conditions necessary for college completion.” Consequently, another implication from the study is that there is a need to identify the support structures in place at School A and B that have ensured all students success in high school and college to be shared as best practices to other ECHS and non-ECHS campuses.

Recommendations for Future Study

The failure of the current study to use DCAT™ as an instrument to determine indicators of college success due to sparse formative assessment data leaves room for future research using this reporting tool in a longitudinal study tested with a pilot school. Other recommendations for further study include

1. Using longitudinal data to evaluate how Algebra I and world history may relate to post-secondary completion among a larger sample of early college high schools
2. Measuring non-cognitive factors, socioeconomic status, ethnicity, and gender, in several cohorts of early college high school students in Texas and across the nation to examine the support structures implemented for post-secondary success
3. Replicating the study using non-early college high schools students to determine indicators of college success

Conclusion

The purpose of this study was to determine early warning indicators of future college readiness among early college high school graduates. The findings from the study indicated grades in Algebra I and world history to be the strongest significant early warning indicators of whether or not a student will maintain a 2.5 college GPA during the first year of college. Based on the findings from this study suggest high school
curriculum needs to focus on ensuring students have mastered the competencies in courses such as Algebra I and world history that indicate college readiness to prepare them for future success in learning beyond high school.

The study also evaluated the relationship between the TAKS English and math results, year-end averages in core high school courses, attendance, and college GPA. The results from this current study support literature regarding the connection between Algebra and rigorous high school courses to improve a student’s opportunity to be college ready upon high school graduation. Further, the results from this study of the two early college high schools found no significant relationship between socioeconomic status, gender or ethnicity and a student’s ability to maintain a 2.5 or higher college GPA. The findings also validate previous research on the importance of offering students a rigorous high school curriculum that can prepare them to enroll in college entry courses without remediation.

If our nation and education system, truly desires to close the college readiness gap and focus on preparing all students to succeed in college, then state-mandated assessments cannot continue to be determining measurement of student success. It is time for educators to step back and decide if the student data that have been reviewed is the right kind of data to bridge the college readiness gap to ensure the opportunity of a rigorous and college preparations for all students. Furthermore, for education reform to evolve in preparing all students college prepared, state-mandated assessments must not continue to be overemphasized in the accountability system and should move forward in developing aligned CCRS assessments in content areas that provides
teachers with the needed data to determine whether students are on track or off track to graduate college ready.
REFERENCES


