

DIFFERENCES IN DEVELOPMENTAL EDUCATION ENROLLMENT AND  
PERFORMANCE AT TEXAS 4-YEAR UNIVERSITIES: A MULTIYEAR,  
STATEWIDE STUDY

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Doctor of Education

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by

Kimberly Priesmeyer

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## **DEDICATION**

This dissertation is dedicated to Anna and Emma Priesmeyer. Its existence serves as proof that anything is possible even under the most difficult circumstances. Young women and old women must continue striving and learning. There will be challenging days ahead as life progresses, but productivity and distractions will preserve one's sanity. Remember, one of the few things in life that cannot be taken away is one's education.

## **ABSTRACT**

Priesmeyer, Kimberly, *Differences in developmental education enrollment and performance at Texas 4-year universities: A multiyear, statewide study*. Doctor of Education (Educational Leadership), May 2017, Sam Houston State University, Huntsville, Texas.

### **Purpose**

The purpose of this journal-ready dissertation was to analyze the numbers and percentages of students enrolled in developmental education in reading, mathematics, and writing at 4-year universities in Texas from the 2002-2003 through the 2009-2010 academic years. In addition, students who were enrolled in developmental education in reading, mathematics, and writing and who then completed a college-level course were analyzed. Specifically, the differences from the 2002-2003 to the 2009-2010 academic years were examined. The multiple academic years analyzed determined which trends were present in numbers and percentages of developmental education students in reading, mathematics, and writing at 4-year universities in Texas.

### **Method**

A longitudinal, exploratory investigation was used herein (Johnson, 2001). Archival data were downloaded and analyzed from the Texas Higher Education Board Interactive Accountability System in each of the three empirical studies in this journal-ready dissertation. Specifically, archival data were obtained for the 2002-2003 through the 2009-2010 academic years for the numbers and percentages of students enrolled in developmental education in reading, mathematics, and writing at Texas 4-year universities.

## **Findings**

Statistically significant differences were present in all academic years for students enrolled in developmental education in reading. Numbers and percentages of students enrolled decreased, and students who completed a college-level course in reading increased. Statistically significant differences were present for numbers of students enrolled in developmental education in mathematics and for percentages of students who completed a college-level course in mathematics. Both the numbers of students enrolled and the percentages of students who completed a college-level course in mathematics increased. However, a statistically significant difference was not present for percentages of students enrolled in developmental education in mathematics. Statistically significant differences were present for percentages of students enrolled in developmental education in writing and for percentages of students who completed a college-level course in writing. The percentages of students enrolled decreased and the percentages of students who completed a college-level course in writing increased. However, a statistically significant difference was not present for numbers of students enrolled in developmental education in writing. The numbers of students remained nearly the same over the years of the study.

**Keywords:** Developmental education, Reading, Mathematics, Writing, Texas, 4-year universities, College-level course completion

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## **CHAPTER I**

### **INTRODUCTION**

Earning a college degree is an increasingly expensive endeavor. Since the mid 1980's, the college education inflation rate has risen a staggering 500%, while the consumer price index has increased a mere 115% (Odland, 2012). Despite recent criticisms and concerns about the exorbitant cost of college, college graduates continue to enjoy its benefits by having "larger earnings over a lifetime, lower unemployment rates, better health, higher marriage rates, and greater civic involvement" (Rose, 2013, p. 25). A Pew Research Center (2011) survey indicated that 94% of adults had the expectation their own children would attend college, and 86% of adults confirmed their own college degrees were money well spent. Regardless of its high price tag, a 4-year college degree continues to be a part of the coveted American Dream, the desire for financial independence, home ownership, and sustainable employment.

Recent statistics regarding the benefits of a college degree support these ideas. The National Center for Education Statistics (2013) reported that for individuals ages 25-34 with a bachelor's degree, the rate of unemployment in 2012 was only 4.1%. In contrast, nearly 13% of that same age group lacking a college degree were unemployed. Karageorge (2014) agreed that tolerance for the cost of a college degree was due to its continued success as a valuable asset. Between 1970 and 2013, individuals who held a bachelor's degree earned an average of 56% more than high school graduates. Gee, Hawk, and Norton (2015) identified even less obvious benefits of a college degree. College graduates are more likely to read to their own children, have lower rates of obesity and smoking, and are less likely to be incarcerated (Gee et al., 2015). Therefore,

achieving a college degree contributes to a society that is employed, financially stable, health conscious, and family oriented.

### **Literature Review Search Procedures**

For this journal-ready dissertation, the literature regarding developmental education reading courses, developmental mathematics courses, and developmental writing courses for Texas 4-year universities was examined. Phrases that were used in the search for relevant literature for developmental education reading were: developmental education, literacy, reading, remediation, and college readiness. Phrases that were used in the search for relevant literature for developmental education mathematics were: developmental education, mathematics, remediation, and college readiness. Phrases that were used in the search for relevant literature for developmental education writing were: developmental education, writing, remediation, and college readiness. All searches were conducted through the EBSCO Host database for academic journals that contained scholarly peer reviewed articles.

A key word search for “developmental education” generated 3,764 results and by limiting the range from 2006 to 2016 and including the word “reading,” the search was reduced to 141. When “literacy” was used for the key word search for articles between 2006 and 2016, 20,986 articles were displayed. A key word search for “remediation” from 2006 to 2016 yielded 862 results. By including the word “reading” the field narrowed to 168. When “college readiness” was used for the key word search for articles from 2006 to 2016, 2,398 articles were generated; adding “reading” to this key word search further reduced the number of articles to 168.



A key word search for “developmental education” generated 3,764 results and by limiting the range from 2006 to 2016 and including the word “mathematics,” the search was reduced to 134. When “remediation” was used for the key word search for articles between 2006 and 2016, 862 articles were displayed. By including the word “mathematics” the field narrowed to 107. When “college readiness” was used for the key word search for articles from 2006 to 2016, 2,398 articles were generated; adding “mathematics” to this key word search further reduced the number of articles to 163.

A key word search for “developmental education” generated 3,764 results and by limiting the range from 2006 to 2016 and including the word “writing,” the search was reduced to 2,987. When “remediation” was used for the key word search for articles between 2006 and 2016, 862 articles were displayed. By including the word “writing” the field narrowed to 156. When “college readiness” was used for the key word search for articles from 2006 to 2016, 2,398 articles were generated; adding “writing” to this key word search further reduced the number of articles to 135.

### **Review of the Literature on Developmental Education and Reading**

Most Americans support the idea of a college degree and believe that attaining a 4-year college degree continues to be a contributing factor for employment success and financial stability (Pew Research Center, 2011). Adults with and without a college degree experienced substantial differences in their earnings (Supiano, 2014). Therefore, a 4-year college degree may provide the benefits associated with the so-called American Dream: home ownership, sustained employability, and financial independence. A college degree may contribute to career satisfaction, and given the widely held belief of the importance of the relationship between career and happiness, a college degree may assist

to provide this benefit as well. Earning a 4-year college degree functions as an important component in providing American workers with stable employment and financial success.

Unfortunately, the United States is experiencing a crisis in college readiness, despite a widespread belief in and desire for a college degree. According to the ACT (2013), only 25% of students were college ready in the four subjects of reading, mathematics, science, and writing. Numerous researchers (e.g., Barnes & Slate, 2013; Harvey, Slate, Moore, Barnes, & Martinez-Garcia, 2013; Clark, Slate, Moore, & Barnes, 2015; Saxon, Slate, & Barnes, 2015) have examined the issue of college readiness.

In a recent review of the literature, Harvey et al., (2013) identified several factors that may influence college readiness, including SAT and ACT scores, ethnicity, socioeconomic status, and self-determination. Because of these multiple factors, Barnes and Slate (2013) suggested that a lack of college preparedness cannot be remedied by previous lockstep methods of “high-stakes testing and stringent accountability measures which have perpetuated the one-size-fits-all” (p. 3) philosophy of improving students’ college readiness. In addition, Saxon et al., (2015) indicated that the methods used typically to assess college readiness, such as earning a high school diploma, completing college preparatory courses, and passing state-required, exit-level examinations, were not reliable tools for determining actual college readiness. Many college students who had met these criteria were not college ready once enrolled in college courses. Clark et al. (2015) concluded that although many methods are used to determine college readiness and much discussion among educators exists about solutions to this crisis, gaps in the

literature remain, creating the need for more research to determine how to mitigate the effects of not being prepared for postsecondary education.

Identifying the challenges of college readiness is important because one of the most essential indicators of student success in college is their preparedness for college course work (Gallard, Albritton, & Morgan, 2010). Bailey (2009) declared that at least one half, and perhaps more, of incoming college students were not college ready. An additional measure that may determine even more students lacking college readiness is the Common Core State Standards, set academic-achievement benchmarks adopted by 45 states. This assessment may demonstrate that an even larger number of students do not possess college readiness skills upon graduating from high school (Mangan, 2014).

Reading proficiency is one critical area in which students lack college readiness. Barnes and Slate (2013) documented that only 53.91% of graduating high school seniors in Texas in 2009 were college ready in reading. McCormick, Hafner, and Germain (2013) identified that only 52% of high school graduates in 2012 were college ready in reading, and the college-readiness rates in reading among Black and Hispanic students were even lower according to the ACT. College students are reading less than ever, and their reading skills have deteriorated (Huang, Capps, Blacklock, & Garza, 2014).

Therefore, the path of many students to a desired 4-year college degree may be hindered by poor reading skills. The ability to comprehend and analyze college-level reading is a basic skill necessary for success in most college-level courses. "Reading is the critical core skill underlying all the curriculum areas," said Schmeiser, ACT's vice president for research and development. "If kids are reading at a college level, they are also ready to go into, in greater proportions, college-level math and science courses" (Manzo, 2006, p. 1).

One term often used to define reading skills is the word *literacy*, characterized as “the ability to access, evaluate, and integrate information from a wide range of textual sources” (Reardon, 2013, p. 18). These skills are acquired by students most rapidly during the elementary and middle school years (Reardon, 2013). However, many students lack literacy and fall behind during their early educational years and they are not able to improve their reading skills through high school and into college. Manzo (2006) noted, “In terms of readiness for college-level reading, students are actually losing momentum during high school” (p. 1). The implication of lacking literacy goes beyond just the college classroom. Reading skills are foundational for individual success not only in school but also for future economic success (Stinnett, 2014).

### **Review of the Literature on Developmental Education in Mathematics**

Abraham, Slate, Saxon, and Barnes (2014) recently investigated the college-readiness crisis specifically as it pertains to mathematics. Abraham et al. (2014) documented that nearly 42% of Texas college students in 2008 were not college ready in mathematics. Unfortunately, over a 3-year period, a lack of any substantial increase in college-readiness scores in mathematics for students who were first time in college (FTIC) was demonstrated, indicating that readiness efforts attempted by K-12 and college educators were unsuccessful. In contrast, FTIC students who were college ready in mathematics had a much higher rate of passing a college-level mathematics course within one year than FTIC students who were not college ready (Abraham et al., 2014). Differences in college readiness in mathematics could likely affect student success, persistence rates, and graduation rates.

Other researchers (e.g., Barnes & Slate, 2011; Barnes & Slate, 2013; Combs et al., 2010; Saxon et al., 2015) have also determined that college-readiness in mathematics is in crisis. Saxon et al. (2015) observed that only about 40% of Texas college students met the state's mathematics readiness standard in 2007. When considering students by ethnicity/race, Black and Hispanic students have statistically significantly lower college readiness rates in mathematics than do White students (Barnes & Slate, 2011). Focusing on student gender, Combs et al. (2010) established that boys scored higher on examinations measuring college readiness in mathematics than girls, which presents a worrisome gap of achievement. Finally, Barnes and Slate (2013) suggested that America's effort to keep pace with global scientific and technological achievements in the 1950s and 1960s was one cause for current ineffective college-readiness measurements in mathematics. These well-intentioned efforts led both to misguided policies for measuring college readiness and to lacking remedies for improving college readiness in mathematics.

Proficiency in mathematics is one critical area where American college students are ill-equipped for college-level courses. Hodara (2013) suggested several interventions were necessary to improve mathematics college readiness among U.S. students, including better prematriculation programs for high school students, reformed developmental mathematics programs, and new teaching strategies in mathematics classrooms. Lacking mathematics skills could have serious implications for American workers in a competitive global economy where mathematical skills were often required when applicants seek jobs (Bailey & Borwein, 2012; Carnegie Institute, 2009). College

students and graduates must be well prepared for a job force that demands adept mathematical skills or they risk being left behind in a changing economy.

Poor mathematics performance in college may be linked to other factors related to secondary schools. The onset and popularity of block scheduling was one reason cited. Zelkowski (2010) suggested mathematics students experienced detrimental breaks in their instruction with block scheduling, which oftentimes allowed students to take a mathematics class only once a year and for one semester. This months-long interruption could inhibit continuous mathematics instruction for struggling students. Furthermore, lacking college readiness in mathematics may be caused by student inability to achieve mastery in basic high school courses, such as algebra. Corbishley and Truxaw (2010) noted results of a mathematics faculty survey that provided some indication about the severity of inadequate college readiness among students. According to faculty surveyed, only about 9% believed that their freshmen students were prepared for their first mathematics course. One faculty member replied that “Too many need to retake second, and even first, year high school algebra. Those who don’t need those remedial classes are typically just adequate in algebra skills except incoming math and science majors” (Corbishley & Truxaw, 2010, p. 76). Latterell and Frauenholtz (2007) reported college readiness in mathematics was a complex issue and rooted in a variety of causes.

### **Review of the Literature on Developmental Education in Writing**

Although substantial evidence exists to support the importance of earning a college degree, many students do not meet readiness standards that will allow them to experience success in college. In fact, only 19 of every 100 students are ready for college-level course work (Royster, Gross, & Hochbein, 2015). According to the ACT

(2013), 31% of students who took the ACT did not meet any of the college-readiness benchmarks for writing. This percentage is ironic given the fact that average GPAs have increased over the last 20 years as have the number of students enrolled in upper level high school courses (Hess, 2016). Regardless, college readiness remains a challenge for many students. To address the issue of poor college readiness skills, most states have adopted reforms, including the Common Core Standards, to work toward college readiness for all students and to indicate that a high school diploma actually signals preparedness for college-level courses (Gaertner & McClarty, 2015).

According to The Nation's Report Card (2011), a series of assessments given to students since 1969 to gauge student educational status and progress, only 24% of high school seniors performed at the proficient level when given a computer-based writing test, indicating these students possessed clear communication skills in writing. Of note was that only 52% of high school seniors scored at the basic level, a level that indicates only partial mastery of writing skills. Black and Hispanic students scored lower than White and Asian students. Boys scored lower than girls, and students from families without college-educated parents scored lower than students whose parents did have college degrees. As such, The Nation's Report Card (2011) provided a revealing empirical analysis of the poor writing skills of high school students, along with identifying the presence of gaps in writing achievement.

Business leaders, too, are noticing lacking writing proficiency among today's workers, many of whom have college degrees. Moore (2016) reported that \$3.1 billion is spent by America's businesses to remediate writing among its employees. Employers noted that 26.2% of its college-educated workers had poor writing skills (Moore, 2016).

Marginal writing proficiency seems to extend from the classroom to the work place, creating problems for workers who must produce quality emails, reports, and presentations to succeed.

Several researchers (Carter & Harper, 2013; Crank, 2012; Relles & Tierney, 2013) have investigated college readiness specifically as it pertains to writing. Carter and Harper (2013) investigated multiple reasons behind poor student writing, including grade inflation and reduced standards at the high school level. Although many college students believe their writing is satisfactory, SAT writing scores have shown a downward trend since the 1970s (Carter & Harper, 2013). Furthermore, Crank (2013) identified six themes common to both high school and college writing instruction. These themes may inform educators about what students have learned in the past or will learn in the future about writing in hopes of improving college readiness (Crank, 2013). Interestingly, poor writing skills among incoming college students may be the result of lacking computer literacy in addition to writing struggles. Relles and Tierney (2013) examined struggling writers in relationship to their challenges with technology and determined that, “The data suggest a cautionary tale in which digital under preparedness poses a hidden threat to students whose degree prospects are already severely reduced by underprepared composition skills” (Relles & Tierney, 2013, p. 500).

An additional factor related to technology that may hinder college readiness in writing is the onslaught and popularity of social media. According to the Pew Research Center (2015), 90% of young adults ages 18-29 use social media. Lytle (2011) reported that many teachers struggle to assist students about correct writing practices in the face of social media, where abbreviating all words and ideas is favored. Even some younger



teachers use shortened forms of written communication, and their standards for writing formality for their students may not be as stringent as that of older teachers (Lytle, 2011). Purcell, Buchanan, and Friedrich (2013) acknowledged that while some educators believe social media expanded writing creativity and opportunities, it also may influence student ability to discern between informal and formal writing, and social media may encourage students to see technology as a toy for entertainment and not a tool for serious writing and research. Therefore, the advantages of technology use for writing may be diminished by social media, which may influence college readiness in writing. As noted, many complex reasons exist for poor writing skills among incoming college students.

### **Persistence as a Function of Developmental Education**

A large portion of higher education institutional planning is centered on retaining students (Claybrooks & Taylor, 2016). Student persistence, which refers to students transitioning from one year to the next year (Texas Higher Education Coordinating Board, 2012), is at a crossroads in higher education. At 4-year public institutions, the dropout rate is 42%, indicating that within six years, 42% of first-time, full-time students had not graduated with a bachelor's degree. At less selective institutions with open admissions, the dropout rate is even higher at 63% (National Center for Education Statistics, 2016a). When considering students by ethnicity/race, dropout rates among Hispanic and Black students are alarmingly high and far exceed the dropout rates of White students (Spangler & Slate, 2015). Two reasons cited for the higher dropout rates of Hispanic and Black students are financial challenges and family obligations (Witkow, Huynh, & Fuligni, 2015). Therefore, colleges need to invest resources to determine how to improve student retention for a diverse student population.

Strategies to enhance student persistence range from the required first-year experience course to extensive efforts to integrate students into college social and academic life (Claybrooks & Taylor, 2016). Because so many students arrive on college campus lacking academic skills, institutions focus on remediation as one method to retain students to improve persistence (Stewart, Lim, & Kim, 2015). Developmental education courses are a primary component of focused remediation. The goal of these courses is to improve academic proficiency so that students could enroll in credit-bearing courses.

However, Clark, Slate, Moore, and Barnes (2015) determined that developmental education did not positively influence persistence or graduation rates over a 3-year period for White, Black, and Hispanic students. Through a review of the literature, Clark et al. (2015) identified several developmental education challenges, including inconsistencies about the definition of college readiness, unreliable placement test scores as the sole indicator of college readiness, and debates about whether high schools or colleges should deliver developmental education. Also, Abraham et al. (2014) documented that over a 3-year period, the average percentage of students who had taken a developmental mathematics course and then passed a college-level mathematics course with at least a “C” was less than 6%. When Abraham et al. (2014) examined college readiness in one of those years, 2008, nearly the same percentage of FTIC students were deemed college ready in mathematics as FTIC students who were enrolled in developmental courses in mathematics. Therefore, discrepancies exist between high school and college definitions of college readiness. Unfortunately, students taking developmental courses were much less likely to complete college with a degree than were students who never required developmental education (Bailey, Jeong, & Cho, 2010). Developmental education

courses as a strategy to improve persistence and retention have not been successful for most students.

The President's Council of Advisors on Science and Technology (2017) called for an improvement in student skills in science, technology, engineering, and mathematics (STEM) to keep pace in an economically competitive society and for 100,000 teachers to be trained in STEM over the next decade. This plea may originate in the fact that only 44% of high school graduates in 2013 were college ready in mathematics (National Math Science Initiative, 2016). To that end, an imperative exists to improve college readiness in mathematics.

Hispanic and Black students, in particular, need additional support and different teaching styles at both the secondary and postsecondary levels to achieve college-level proficiency in mathematics (Houser & An, 2015). Unfortunately, many Hispanic and Black students attend high schools with scant resources and unqualified teachers, making mathematics achievement a difficult task (Atuahene & Russell, 2016). Foltz, Gannon, and Kirschmann (2014) suggested more Hispanic and Black students should be encouraged to choose STEM majors by utilizing enhanced and varied recruitment and persistence efforts.

Struggling students with poor mathematics skills rely on developmental education courses to improve their proficiency so they can progress to college-level mathematics courses. However, developmental courses are largely unsuccessful for many students (Bailey et al., 2010). In 2008, nearly 95% of Texas students who completed a developmental mathematics course could not pass a first-year, college-level mathematics

course (Abraham et al., 2014). Although remediation in mathematics is needed, only marginal success has been achieved through developmental education courses.

In developmental education, efforts are made to bridge the gap between lacking college readiness and college preparedness. Sometimes referred to as remedial education, the intent behind these courses is to improve students' skills in reading, mathematics, and writing prior to students enrolling in credit-bearing courses.

Unfortunately, many students are not benefitting from these courses despite the worthwhile goals of these courses (Edgecombe, 2011). Persistence rates, defined by the Texas Higher Education Coordinating Board as students who "continue from one year in higher education to the succeeding year" (2012, p. 48), have lagged for these students. Despite the well-intentioned efforts of postsecondary institutions to prepare students for college course work, many students were not persisting through these developmental courses (Bailey et al., 2010). Students were not progressing to credit-bearing courses, which indicated they were not on track to graduate.

Many researchers (e.g., Bailey, 2009; Bailey et al., 2010; Crews & Aragon, 2007; Mangan, 2012) have questioned the effectiveness of developmental education programs to improve persistence rates. Evenbeck, president of City University of New York's experimental community college, concurred, "When students go into remediation they never leave it. . . And among students who are in the bottom tier of remedial programs the graduation rate is less than 1 percent" (Selingo, 2013, p. 187). Developmental courses are designed to improve persistence rates among unprepared college students; however, extensive evidence exists that these courses are failing in that effort (Bailey, 2009; Bailey et al., 2010; Edgecomb, 2011; Mangan, 2012).

One way that institutions are attempting to improve persistence rates through developmental education is by modifying the delivery methods of these courses. A review of the literature revealed that reformed models of developmental education were more effective than traditional models. According to Mangan (2014), concurrent models are being evaluated in colleges. Students were able to take their developmental courses along with their college-credit courses. The accelerated model is another new type of reformed developmental course. These courses allow students to enroll in shorter developmental courses (Hodara & Jaggars, 2014). One goal of accelerated courses is developmental course requirements can be completed more quickly and students benefit from additional academic support (Edgecomb, 2011). An Accelerated Learning Program course “meets in the class period immediately following the college-level class” (Bailey et al., 2010, p. 48). Students are enrolled in the college-credit course and the developmental course at the same time. These new types of developmental courses may be more effective than traditional approaches (Levin & Calcagno, 2007), and shorter completion times may encourage students to persist through them (Sheldon & Durdella, 2010).

### **Statement of the Problem**

According to Williams, Ari, and Santamaria (2011), “Reading comprehension is a complex cognitive skill that is required for adults to succeed and keep up with societal demands” (p. 215). Unfortunately, numerous researchers (e.g., Ari, 2014; Barnes & Slate, 2013; Braze, Tabor, Shankweiler, & Mencl, 2007; Macaruso & Shankweiler, 2010) have documented a lack of proficiency in reading for college students. Many college instructors noted that students not only did not want to read their textbooks, but when

they did, they were unable to understand the reading (Culver, 2011). Ari (2013) reported that only 48% of college students were college ready in reading according to the College Board's ACT, and SAT reading scores had fallen to their lowest rate since 1972.

In addition, The President's Council of Advisors on Science and Technology (2017) called for an improvement in student skills in science, technology, engineering, and mathematics (STEM) to keep pace in an economically competitive society and for 100,000 teachers to be trained in STEM over the next decade. This plea may originate in the fact that only 44% of high school graduates in 2013 were college ready in mathematics (National Math Science Initiative, 2016). To that end, an imperative exists also to improve college readiness in mathematics.

Finally, in *Are They Really Ready to Work?* (Barrington & Casner-Lotto, 2006), a study produced by a consortium of human resource professionals that surveyed over 400 employers, workforce readiness was defined as workers who are "equipped with the basic knowledge and applied skills necessary to be competitive in the global economy of the 21st century" (p. 8). Employees' written communications were a top priority among employers. Unfortunately, 80.9% of high school graduates, 47.3% of 2-year college graduates, and 27.8% of 4-year college graduates were rated as deficient in writing communications per this study and survey.

Therefore, underprepared college students enroll in developmental courses as one strategy to prepare them for college-level course work. To address the challenges faced by students, postsecondary institutions have designed developmental courses to improve student skills. Developmental education courses are an important part of achieving a degree for students who enter college with poor academic skills. This instruction is

important because only about 10% of students who are not college ready and do not receive remediation will ever complete a degree (Crews & Aragon, 2007).

### **Purpose of the Study**

The purpose of this journal-ready dissertation was to determine the numbers and percentages of students who were enrolled in developmental education in reading, mathematics, and writing at Texas 4-year universities during the 2002-2003 through the 2009-2010 academic years. A second purpose was to ascertain the degree to which the numbers and percentages of students who were enrolled in developmental education in reading, mathematics, and writing changed from the 2002-2003 through the 2009-2010 academic years in Texas 4-year universities. A third purpose was to determine the extent to which student completion of a college-level course in reading, mathematics, and writing changed between the 2003 and the 2010 academic years. The next purpose of this journal-ready dissertation was to ascertain the degree to which a trend might be present both in the numbers and percentages of students who were enrolled in developmental education in reading, mathematics, and writing. A final purpose was to determine student completion of a college-level course in reading, mathematics, and writing during the 2002-2003 through the 2009-2010 academic years. Given the emphases placed on retention and 4-year college-degree attainment, an imperative exists to ascertain the relationship between developmental course enrollment and student success.

### **Significance of the Study**

Numerous research investigations (Abraham et al., 2014; Bailey et al., 2010; Clark et al., 2015; Edgecomb, 2011; Saxon et al., 2015) have been conducted in the field

of developmental education and the efforts of universities to provide remediation for large numbers of underprepared students. Gallard, Albritton, and Morgan (2010) contended the single most important indicator of student success in college is preparedness for college course work. These efforts are important because only about 10% of underprepared students who did not receive assistance completed a degree (Crews & Aragon, 2007). The findings of the three studies in this journal-ready dissertation may urge higher education educators and administrators to identify trends in enrollment that may lead to improved developmental education courses. Furthermore, findings may also provide secondary school teachers and administrators with empirical data to make sound decisions regarding the academic preparedness of high school students.

### **Definition of Terms**

Terms that are important to the three research studies that were conducted in this journal-ready dissertation are provided for the reader below.

#### **College-level Course**

The Texas Higher Education Coordinating Board (2012) defines a college-level course as course that “if successfully completed, can be applied toward the number of courses required for achieving a degree, diploma, certificate, or other formal award” (p. 1).

#### **College Readiness in Mathematics**

According to the ACT’s College and Career Readiness Standards-Mathematics (2016a), the college-readiness benchmark is a score of 22 on the ACT Mathematics test. Students who earn a score of 22 have demonstrated they are able to round numbers, use



exponents, and determine absolute value, among other skills. These students have a 50% likelihood of earning a B or better in College Algebra at a typical college.

### **College Readiness in Reading**

According to the ACT's College and Career Readiness Standards-Reading (2016b), the college-readiness benchmark is a score of 22 on the ACT Reading test. Students who earn a score of 22 have demonstrated they are able to locate details, draw logical conclusions, and paraphrase statements in somewhat challenging reading passages. These students have a 50% likelihood of earning a B or better in a social science course during their first year at a typical college.

### **College Readiness in Writing**

According to the ACT's College and Career Readiness Standards-Writing (2016c), college readiness is determined by demonstrating proficiency in specific writing skills: expressing judgments, focusing on a topic, developing ideas, organizing ideas, and using language.

### **Developmental Education**

The Texas Higher Education Coordinating Board (2012) defines Developmental Education “as courses, tutorials, laboratories, or other efforts to bring students’ skill levels in reading, writing, and mathematics to entering college level” (p. 25).

### **Developmental Education in Mathematics**

According to the National Association for Developmental Education (2016), the goals of developmental education are to “address academic preparedness, diagnostic assessment and placement, development of general and discipline-specific learning

strategies, and affective barriers to learning” (p. 1) as they relate to mathematics proficiency for college students.

### **Developmental Education in Reading**

According to the National Association for Developmental Education (2016), the goals of developmental education are to “address academic preparedness, diagnostic assessment and placement, development of general and discipline-specific learning strategies, and affective barriers to learning” (p. 1) as they relate to reading proficiency for college students.

### **Developmental Education in Writing**

According to the National Association for Developmental Education (2016), the goals of developmental education are to “address academic preparedness, diagnostic assessment and placement, development of general and discipline-specific learning strategies, and affective barriers to learning” (p. 1) as they relate to writing proficiency for college students.

### **Persistence**

The Texas Higher Education Coordinating Board (2012) defines persistence as “the rate at which students persist in higher education, often as measured by the percentage of students who continue in higher education from one year to the succeeding year” (p. 48).

### **Texas Higher Education Coordinating Board**

The Texas Higher Education Coordinating Board regulates the policies and procedures for public higher education in Texas (2012). It is the highest authority for public higher education issues and concerns in the state. Two primary goals of the Texas

Higher Education Coordinating Board are in the areas of achieving student success and providing research.

### **Texas Higher Education Coordinating Board Accountability System Database**

The Texas Higher Education Coordinating Board (2012) Accountability System database is used to track performance of important measures that embody the missions of higher education institutions in Texas). This system was modeled on the state's higher education plan, *Closing the Gaps by 2015* (Texas Higher Education Coordinating Board, 2012). Additionally, the Texas Higher Education Coordinating Board Accountability System provides data for every public university and community college in Texas.

### **Texas Success Initiative (TSI)**

According to the Texas Higher Education Coordinating Board (2012), the Texas Success Initiative is a law that “requires all entering college students to be assessed for college readiness in reading, mathematics and writing” (p. 63) unless the student is eligible for an exemption. According to the Texas Higher Education Coordinating Board (2012), each student who fails to meet the minimum passing score of the institution’s entrance exam offered will be placed in a developmental education course or courses to assist the student to achieve college readiness.

### **Delimitations**

One delimitation in this journal-ready dissertation was that only student achievement as a function of developmental course enrollment was analyzed. A second delimitation was that only eight academic years of data (i.e., 2002-2003 through 2009-2010) were analyzed, thus restricting generalizability of the results to these seven academic years. A third delimitation was that college-credit courses were not defined by

specific courses. Rather, passing any college-credit course indicated student success as a function of developmental course enrollment.

### **Limitations**

The purpose of this journal-ready dissertation was to determine the numbers and percentages of students who were enrolled in developmental education in reading, mathematics, and writing at Texas 4-year universities during the 2002-2003 through the 2009-2010 academic years. As such, the major limitation was that only Texas data from the Texas Higher Education Coordinating Board were used. Furthermore, only data from 4-year universities were analyzed. Finally, only eight academic years of data were analyzed in the three articles in this journal-ready dissertation.

### **Assumptions**

For the purpose of this journal-ready dissertation, the assumption was made that the data downloaded from the Texas Higher Education Coordinating Board Interactive Accountability System were accurately reported to the state. Furthermore, the consistency in which Texas 4-year universities collect and report student data was assumed to be accurate and consistent statewide. As such, any deviations from these assumptions may result in inaccurate data yielding varying outcomes.

### **Organization of the Study**

In this journal-ready dissertation, three research investigations were conducted. In the first journal-ready dissertation article, research questions were on the relationship between developmental course enrollment in reading and student success in college-credit courses for the 2002-2003 through the 2009-2010 academic years. In the second journal-ready dissertation article, the research questions addressed were on the

relationship between developmental course enrollment in mathematics and student success in college-credit courses for the 2002-2003 through the 2009-2010 academic years. Finally, for the third journal-ready dissertation article, research questions addressed the relationship between developmental course enrollment in writing and student success in college-credit courses for the 2002-2003 through the 2009-2010 academic years.

This journal-ready dissertation is comprised of five chapters. Included in Chapter I is the background of the study, statement of the problem, purpose of the study, significance of the study, definition of terms, delimitations, limitations, assumptions, and outline of the proposed journal-ready dissertation. In Chapter II, the first journal-ready dissertation investigation involving developmental course enrollment in reading is provided. In Chapter III, the second journal-ready research investigation on developmental course enrollment in mathematics is discussed. In Chapter IV, the third journal-ready research investigation on developmental course enrollment in writing is presented. Finally, in Chapter V, an overview of results interpreted from the three studies is provided. Included in this chapter are implications for future policy decisions and recommendations for future research.

## CHAPTER II

### DIFFERENCES IN DEVELOPMENTAL EDUCATION ENROLLMENT AND READING PERFORMANCE AT TEXAS 4-YEAR UNIVERSITIES: A MULTIYEAR, STATEWIDE STUDY

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This dissertation follows the style and format of *Research in the Schools (RITS)*.

### **Abstract**

In this investigation, the numbers and percentages of students enrolled in developmental education in reading at Texas 4-year universities were analyzed for the 2002-2003 through the 2009-2010 academic years. Determined in this analysis was whether numbers and percentages of students enrolled in developmental education in reading decreased or increased over time. Revealed in this analysis were statistically significant differences in the numbers and percentages for the 2002-2003 through the 2009-2010 academic years. The numbers and percentages of students enrolled in developmental education in reading decreased over this 8-year time period. Moreover, in the 2007-2008 academic year, over 70% of students in developmental education completed a college-level course in reading. Results, implications for policy, and recommendations for research were provided.

**Keywords:** Developmental education, reading, Texas, 4-year universities, college-level course completion

## DIFFERENCES IN DEVELOPMENTAL EDUCATION ENROLLMENT AND READING PERFORMANCE AT TEXAS 4-YEAR UNIVERSITIES: A MULTIYEAR, STATEWIDE STUDY

According to a survey performed by the Pew Research Center (2011) in conjunction with *The Chronicle of Higher Education*, 94% of adults expected their own children to attend college and 86% believed their own degrees were a good investment. Surveys such as this one provide evidence that most Americans support the idea of a college degree and believe that attaining a 4-year college degree continues to be a contributing factor for employment success and financial stability. As further support for these views, The National Center for Education Statistics (2013) indicated that the rate of unemployment in 2012 for individuals ages 25-34 with a bachelor's degree was only 4.1%. By comparison, 12.8% of those individuals who had earned only a high school diploma were unemployed. Adults with and without a college degree experienced substantial differences in their earnings (Supiano, 2014). Therefore, a 4-year college degree may provide the benefits associated with the so-called American Dream: home ownership, sustained employability, and financial independence. A college degree may contribute to career satisfaction, and given the widely held belief of the importance of the relationship between career and happiness, a college degree may assist to provide this benefit as well. Earning a 4-year college degree functions as an important component in providing American workers with stable employment and financial success.

### **College Readiness**

Unfortunately, the United States is experiencing a crisis in college readiness, despite a widespread belief in and desire for a college degree. According to the ACT



(2013), only 25% of students were college ready in the four subjects of reading, mathematics, science, and writing. Numerous researchers (e.g., Barnes & Slate, 2013; Harvey, Slate, Moore, Barnes, & Martinez-Garcia, 2013; Clark, Slate, Moore, & Barnes, 2015; Saxon, Slate, & Barnes, 2015) have examined the issue of college readiness.

In a recent review of the literature, Harvey et al. (2013) identified several factors that may influence college readiness, including SAT and ACT scores, ethnicity, socioeconomic status, and self-determination. Because of these multiple factors, Barnes and Slate (2013) suggested that a lack of college preparedness cannot be remedied by previous lockstep methods of “high-stakes testing and stringent accountability measures which have perpetuated the one-size-fits-all” (p. 3) philosophy of improving students’ college readiness. In addition, Saxon et al. (2015) indicated that the methods used typically to assess college readiness, such as earning a high school diploma, completing college preparatory courses, and passing state-required, exit-level examinations, were not reliable tools for determining actual college readiness. Many college students who had met these criteria were not college ready once enrolled in college courses. Clark et al. (2015) concluded that although many methods are used to determine college readiness and much discussion among educators exists about solutions to this crisis, gaps in the literature remain, creating the need for more research to determine how to mitigate the effects of not being prepared for postsecondary education.

Identifying the challenges of college readiness is important because one of the most essential indicators of student success in college is their preparedness for college course work (Gallard, Albritton, & Morgan, 2010). Bailey (2009) declared that at least half, and perhaps more, of incoming college students were not college ready. An

additional measure that may determine even more students lacking college readiness is the Common Core State Standards, set academic-achievement benchmarks adopted by 45 states. This assessment may demonstrate that an even larger number of students do not possess college readiness skills upon graduating from high school (Mangan, 2014).

Reading proficiency is one critical area in which students lack college readiness. Barnes and Slate (2013) documented that only 53.91% of graduating high school seniors in Texas in 2009 were college ready in reading. McCormick, Hafner, and Germain (2013) identified that only 52% of high school graduates in 2012 were college ready in reading, and the college-readiness rates in reading among Black and Hispanic students were even lower according to the ACT. College students are reading less than ever, and their reading skills have deteriorated (Huang, Capps, Blacklock, & Garza, 2014). Therefore, the path of many students to a desired 4-year college degree may be hindered by poor reading skills. The ability to comprehend and analyze college-level reading is a basic skill necessary for success in most college-level courses. "Reading is the critical core skill underlying all the curriculum areas," said Schmeiser, ACT's vice president for research and development. "If kids are reading at a college level, they are also ready to go into, in greater proportions, college-level math and science courses" (Manzo, 2006, p. 1).

One term often used to define reading skills is the word *literacy*, characterized as "the ability to access, evaluate, and integrate information from a wide range of textual sources" (Reardon, 2013, p. 18). These skills are acquired by students most rapidly during the elementary and middle school years (Reardon, 2013). However, many students lack literacy and fall behind during their early educational years and they are not able to improve their reading skills through high school and into college. Manzo (2006)

noted, "In terms of readiness for college-level reading, students are actually losing momentum during high school" (p. 1). The implication of lacking literacy goes beyond just the college classroom. Reading skills are foundational for individual success not only in school but also for future economic success (Stinnett, 2014).

### **Persistence as a Function of Developmental Education**

In developmental education, efforts are made to bridge the gap between lacking college readiness and college preparedness. Sometimes referred to as remedial education, the intent behind these courses is to improve students' skills in reading, mathematics, and writing prior to students enrolling in credit-bearing courses. Unfortunately, many students are not benefitting from these courses despite the worthwhile goals of these courses (Edgecombe, 2011). Persistence rates, defined by the Texas Higher Education Coordinating Board as students who "continue from one year in higher education to the succeeding year" (2012, p. 48), have lagged for these students. Despite the well-intentioned efforts of postsecondary institutions to prepare students for college course work, many students were not persisting through these developmental courses (Bailey, Jeong, & Cho, 2010). Students were not progressing to credit-bearing courses, which indicated they were not on track to graduate.

Many researchers (e.g., Bailey, 2009; Bailey et al., 2010; Crews & Aragon, 2007; Mangan, 2012) have questioned the effectiveness of developmental education programs to improve persistence rates. Evenbeck, president of City University of New York's experimental community college, concurred, "When students go into remediation they never leave it . . . And among students who are in the bottom tier of remedial programs the graduation rate is less than 1 percent" (Selingo, 2013, p. 187). Developmental

courses are designed to improve persistence rates among unprepared college students; however, extensive evidence exists that these courses are failing in that effort (Bailey, 2009; Bailey et al., 2010; Edgecomb, 2011; Mangan, 2012).

One way that institutions are attempting to improve persistence rates through developmental education is by modifying the delivery methods of these courses. A review of the literature revealed that reformed models of developmental education were more effective than traditional models. According to Mangan (2014), concurrent models are being tested in colleges. Students were able to take their developmental courses along with their college-credit courses. The accelerated model is another new type of reformed developmental course. These courses allow student to enroll in shorter developmental courses (Hodara & Jaggars, 2014). One goal of accelerated courses is developmental course requirements can be completed more quickly and students benefit from additional academic support (Edgecomb, 2011). An Accelerated Learning Program course “meets in the class period immediately following the college-level class” (Bailey et al., 2010, p. 48). Students are enrolled in the college-credit course and the developmental course at the same time. These new types of developmental courses may be more effective than traditional approaches (Levin & Calcagno, 2007), and shorter completion times may encourage students to persist through them (Sheldon & Durdella, 2010).

### **Statement of the Problem**

According to Williams, Ari, and Santamaria (2011), “Reading comprehension is a complex cognitive skill that is required for adults to succeed and keep up with societal demands” (p. 215). Unfortunately, numerous researchers (e.g., Ari, 2014; Barnes &

Slate, 2013; Braze, Tabor, Shankweiler, & Mencl, 2007; Macaruso & Shankweiler, 2010) have documented a lack of proficiency in reading for college students. Manzo (2006) claimed that a major problem for many college students is that they are often unable to read the required textbooks. Many college instructors noted that students not only did not want to read their textbooks, but when they did, they were unable to understand the reading (Culver, 2011). Ari (2013) reported that only 48% of college students were college ready in reading according to the College Board's ACT, and SAT reading scores had fallen to their lowest rate since 1972. Because reading proficiency is an important skill in most college courses, its absence can prevent students from achieving educational success.

Therefore, college students enroll in developmental reading courses as one strategy to prepare them for college-level course work. To address the challenges in reading faced by students, postsecondary institutions have designed developmental reading courses to improve student reading skills (Paulson, 2014). Therefore, developmental reading instruction in college constitutes an important part of achieving a degree for students who enter college with poor reading skills. This instruction is important because only about 10% of students who are not college ready and do not receive remediation will ever complete a degree (Crews & Aragon, 2007).

### **Purpose of the Study**

The purpose of this research study was to determine the numbers and percentages of students who were enrolled in developmental education in reading at Texas 4-year universities during the 2002-2003 through the 2009-2010 academic years. A second purpose was to ascertain the degree to which the numbers and percentages of students

who were enrolled in developmental education in reading changed from the 2002-2003 through the 2009-2010 academic years in Texas 4-year universities. A third purpose was to determine the extent to which student completion of a college-level course in reading changed between the 2003 and the 2010 academic years. The final purpose of this research study was to ascertain the degree to which a trend might be present both in the numbers and percentages of students who were enrolled in developmental education in reading, as well as in student completion of a college-level course in reading, during the 2002-2003 through the 2009-2010 academic years. Given the emphases placed on retention and to 4-year college-degree attainment, an imperative exists to ascertain the relationship between developmental course enrollment in reading and student success.

### **Significance of the Study**

Much research has already been conducted concerning ways to assist unprepared college readers through developmental education courses in reading in the hopes that students can experience success in college courses (Dillon, 2007; Gallard, Albritton, & Morgan, 2010; Willingham & Price, 2009). For this study, the phrase, success rates, was used to refer to completion of a college-level course in reading. Few researchers, to date, have focused their efforts on the relationship between developmental course enrollment in reading and college-level reading course completion at Texas 4-year universities over a period of time. Furthermore, an analysis of the relationship between developmental course enrollment in reading and success rates at Texas 4-year universities over time has not occurred to date. By examining the differences in the performance of students who enroll in a developmental reading course and their subsequent completion of a college-level reading course, a trend can be revealed. The findings of this study may have

practical application for educational leaders in higher education, as well as in K-12 settings, to ensure all university students are proficient in reading. By determining the relationship between developmental course enrollment in reading and success rates, quality interventions could be created. Students lacking college-level reading skills could then benefit from a developmental course in reading.

### **Research Questions**

The following research questions were addressed in this empirical investigation:

(a) What are the numbers of students who were enrolled in developmental education in reading at Texas 4-year universities for the 2002-2003 through the 2009-2010 academic years?; (b) What are the percentages of students who were enrolled in developmental education in reading at Texas 4-year universities for the 2002-2003 through the 2009-2010 academic years?; (c) What is the difference in the average number of students who were enrolled in developmental education in reading at Texas 4-year universities between the 2002-2003 and 2009-2010 academic years?; (d) What is the difference in the average percent of students who were enrolled in developmental education in reading at Texas 4-year universities between the 2002-2003 and 2009-2010 academic years?; (e) What are the percentages of students who were enrolled in developmental education in reading and who completed a college-level course in reading in the 2002-2003 through the 2009-2010 academic years?; (f) What is the difference in the percentage of students who were enrolled in developmental education in reading at Texas 4-year universities and who completed a college-level course in reading between the 2002-2003 and 2009-2010 academic years?; (g) What trend is present, if any, in the numbers of students who were enrolled in developmental education in reading at Texas 4-year universities from the

2002-2003 through the 2009-2010 academic years?; (h) What trend is present, if any, in the percentages of students who were enrolled in developmental education in reading at Texas 4-year universities from the 2002-2003 through the 2009-2010 academic years?; and (i) What trend is present, if any, in the percentages of students who were enrolled in developmental education in reading and who completed a college-level course in reading at Texas 4-year universities from the 2002-2003 through the 2009-2010 academic years?

## **Method**

### **Research Design**

For this study, the research design was a longitudinal, explanatory investigation (Johnson, 2001). Archival data were used to answer the research questions previously discussed. Both the independent variables and the dependent variables to be this investigation had already occurred and extraneous variables were not controlled in this study design (Johnson & Christensen, 2012). The independent variable was the specific academic year in which data on developmental education in reading were available. The dependent variables were (a) the number of students who were enrolled in developmental education reading in each of the academic years, (b) the percentage of students enrolled in developmental education reading out of the total student enrollment, and (c) the percentages of students who completed a college-level course in reading.

### **Participants and Instrumentation**

Archival data were obtained from the 2002-2003 through the 2009-2010 academic years from the Texas Higher Education Coordinating Board Interactive Accountability System (2016) for all students at Texas 4-year universities who first enrolled in a developmental education course and then enrolled in a college-level course in reading.



Completion of a college level course in reading, along with enrollment data, from the thirty-nine 4-year universities from the 2002-2003 through the 2009-2010 academic years were analyzed. In some instances, data were not available for some universities; however, all available data were analyzed herein.

Data for this study were downloaded from the Texas Higher Education Coordinating Board Interactive Accountability System (2016), the Texas Higher Education Coordinating Board Developmental Education Accountability Measures Data website. The Texas Higher Education Coordinating Board Interactive Accountability System (2016) is used to track performance of Texas universities on issues considered essential to the success of higher education. For this study, data specifically regarding developmental education courses in reading of students enrolled in 4-year Texas universities were analyzed. Developmental education is defined by the Texas Higher Education Coordinating Board (2012) as “courses, tutorials, laboratories, or other efforts to bring students’ skill levels in reading, writing, and mathematics to entering college level” (p. 25). For this study, only college-level courses completed with a grade of A, B, or C were examined, according to the data provided by the Texas Higher Education Coordinating Board Interactive Accountability System (2016).

## **Results**

To answer the first research question, descriptive statistics were calculated for the numbers of students who were enrolled in developmental education in reading at Texas 4-year universities for the 2002-2003 academic year through the 2009-2010 academic year. The most students ( $n = 7,206$ ) who were enrolled in developmental education in reading was in the 2003-2004 academic year. The fewest number of students ( $n = 4,735$ )

who were enrolled in developmental education in reading was in the final year of the study, the 2009-2010 academic year. With respect to the average number of students who were enrolled in developmental education in reading at Texas 4-year universities, the highest average ( $M = 225.19$ ) was also in the 2003-2004 academic year and the lowest average ( $M = 131.53$ ) was in the 2009-2010 academic year. Readers are directed to Table 2.1 for these descriptive statistics for the numbers of students who were enrolled in developmental education in reading in Texas 4-year universities from the 2002-2003 through the 2009-2010 academic year.

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 Insert Table 2.1 about here  
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To answer the second research question, the intention was to calculate descriptive statistics for the percentage of students who were enrolled in developmental education in reading at Texas 4-year universities for the 2002-2003 academic year through the 2009-2010 academic year. The data available on the Texas Higher Education Coordinating Board Interactive Accountability System, however, were not the percentages of students who were enrolled in developmental education in reading. Rather, the data that were available for downloading at the Texas Higher Education Coordinating Board Interactive Accountability System were the percentages of students who were not enrolled in developmental education in reading. Delineated in Table 2.2 are the descriptive statistics for the percentages of students who were not enrolled in developmental education in reading.

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Insert Table 2.2 about here  
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Because the focus of the second research question was on the percentages of students who were enrolled in developmental education in reading, the average percentages in each academic year were subtracted from 100%. This subtraction yielded the percentages of students who were enrolled in developmental education in reading. The highest average percentage of students ( $M = 34.13\%$ ) who were enrolled in developmental education in reading was in the 2003-2004 academic year, with the lowest average percentage of students ( $M = 16.24\%$ ) who were enrolled in developmental education was in the 2007-2008 academic year. Readers should note that in the most recent academic year of data, 2009-2010, approximately 25% of students in Texas 4-year universities remained enrolled in developmental education courses in reading.

With respect to research question three, prior to conducting inferential statistics to determine whether differences were present in the average number of students who were enrolled in developmental education in reading between the 2002-2003 academic year and the 2009-2010 academic year at Texas 4-year universities, checks were conducted to determine the extent to which these data were normally distributed (Onwuegbuzie & Daniel, 2002). Although some of the values were indicative of non-normally distributed data, a decision was made to use a parametric dependent samples  $t$ -test to answer the third research question. The parametric dependent samples  $t$ -test revealed a statistically significant difference in the average number of students who were enrolled in developmental education in reading,  $t(30) = 2.46, p < .001$ , between the 2002-2003

academic year and the 2009-2010 academic year at Texas 4-year universities. This difference represented a small effect size (Cohen's *d*) of 0.25 (Cohen, 1988). More than one-third fewer developmental education students were enrolled in reading in the 2009-2010 academic year than in the 2002-2003 academic year. Table 2.3 contains the descriptive statistics for this analysis.

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 Insert Table 2.3 about here  
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With respect to research question four, prior to conducting inferential statistics to determine whether differences were present in the average percent of students who were enrolled in developmental education in reading between the 2002-2003 academic year and the 2009-2010 academic year at Texas 4-year universities, checks were conducted to determine the extent to which these data were normally distributed (Onwuegbuzie & Daniel, 2002). Although some of the values were indicative of non-normally distributed data, a decision was made to use a parametric dependent samples *t*-test to answer the fourth research question. The parametric dependent samples *t*-test revealed a statistically significant difference in the average percent of students who were enrolled in developmental education in reading,  $t(29) = -2.21, p < .001$  between the 2002-2003 academic year and the 2009-2010 academic year at Texas 4-year universities. This difference represented a small effect size (Cohen's *d*) of 0.43 (Cohen, 1988). A statistically significantly lower percentage of students were enrolled in developmental education in reading in the 2009-2010 academic year than in the 2002-2003 academic year. Delineated in Table 2.4 are the descriptive statistics for this analysis.

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Insert Table 2.4 about here  
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To answer the fifth research question, descriptive statistics were calculated for the percentages of students who were enrolled in developmental education in reading and who completed a college-level course in reading at Texas 4-year universities for the 2002-2003 academic year through the 2009-2010 academic year. The percentages of these students ranged in the mid-50 percentages in the 2002-2003 academic year through the 2006-2007 academic years. A noticeable increase was documented in the 2007-2008 academic year where 70.65% of students completed a college-level course in reading. In the last two academic years of data analyzed, the percentages of students who had completed a college-level course in reading decreased slightly from the high mark established in 2007-2008 academic year. Readers are directed to Table 2.5 for these descriptive statistics.

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Insert Table 2.5 about here  
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With respect to research question six, prior to conducting inferential statistics to determine whether a difference was present in the percentage of students who were enrolled in developmental education in reading and who completed a college-level course in reading between the 2002-2003 academic year and the 2009-2010 academic year at Texas 4-year universities, checks were conducted to determine the extent to which these data were normally distributed (Onwuegbuzie & Daniel, 2002). Although some of the

values were indicative of non-normally distributed data, a decision was made to use a parametric dependent samples *t*-test to answer this research questions. The parametric dependent samples *t*-test revealed a statistically significant difference in the percentage of students who were enrolled in developmental education in reading and who completed a college-level course in reading,  $t(29) = -5.06, p < .001$  between the 2002-2003 academic year and the 2009-2010 academic year at Texas 4-year universities. This difference represented a moderate effect size (Cohen's *d*) of 0.72 (Cohen, 1988). A statistically significantly higher percentage of students were enrolled in developmental education in reading and completed a college-level course in reading in the 2009-2010 academic year than in the 2002-2003 academic year. Revealed in Table 2.6 are the descriptive statistics for this analysis.

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 Insert Table 2.6 about here  
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With respect to research questions seven, eight, and nine, an analysis of trends of all eight years of data for developmental education students in reading was conducted. As revealed in Figure 2.1 with respect to research question seven, trends were present in the average numbers of students enrolled in developmental education in reading at Texas 4-year universities for the 2002-2003 through the 2009-2010 academic years. In the first three years of the study, the average numbers of students enrolled in developmental education in reading were consistent. However, in the 2005-2006 academic year, the average numbers of students enrolled in developmental education in reading began to decrease. In the final year of this study, the 2009-2010 academic year, 36% fewer

students were enrolled in developmental education in reading than in the first year of the study, the 2002-2003 academic year.

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 Insert Figure 2.1 about here  
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With respect to research question eight, trends were present in the average percentages of students who were enrolled in developmental education in reading at Texas 4-year universities from the 2002-2003 through the 2009-2010 academic years. As revealed in Figure 2.2, similar average percentages of students were enrolled in developmental education in reading in the first three academic years of this investigation. However, in the 2005-2006 academic year, the average percentages of students enrolled in developmental education in reading began to decrease. Over the 8-year period of this study, the 2007-2008 academic year represented the lowest average percentage of students enrolled in developmental education in reading, an 18% decrease from the highest average percentage in the 2003-2004 academic year.

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 Insert Figure 2.2 about here  
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The final research question involved the average percentages of students who were enrolled in developmental education in reading and who completed a college-level course in reading at Texas 4-year universities in the 2002-2003 through the 2009-2010 academic years. As revealed in Figure 2.3, similar average percentages of students were enrolled in developmental education in reading and completed a college-level course in

reading in the first five academic years of this investigation. However, in the 2007-2008 academic year, the average percentage of students who were enrolled in developmental education in reading and who completed a college-level course in reading increased 15%. In the final two years of this study, the average percentages of students who were enrolled in developmental education in reading and who completed a college-level course in reading decreased; however, these average percentages remained approximately 10% higher than the average percentages in the first five years of the study.

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 Insert Figure 2.3 about here  
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### **Discussion**

Presented in this investigation was an analysis of data on students who had been enrolled in developmental education in reading at Texas 4-year universities in the 2002-2003 through the 2009-2010 academic years. Eight years of archival data from the Texas Higher Education Coordinating Board Interactive Accountability System were obtained and analyzed. In this study, at least 30 Texas 4-year universities provided data that were analyzed from the 2002-2003 through the 2009-2010 academic years.

For the eight academic years of data that were analyzed, statistically significant differences were present. In this investigation, the average number of students enrolled in developmental education in reading ranged from a high of 225 in the 2003-2004 academic year to a low of 131 in the 2009-2010 academic year. The average percentage of students enrolled in developmental education in reading ranged from a high of 34% in the 2003-2004 academic year to a low of 16% in the 2007-2008 academic year. The



average percentage of students who were enrolled in developmental education in reading and who completed a college-level course in reading ranged from a low of 55% in the 2002-2003, 2003-2004, and 2006-2007 academic years to a high of 71% in the 2007-2008 academic year.

### **Connections with Existing Literature**

Previous researchers (Hodara & Jagers, 2014; Saxon et al., 2015; Sheldon & Durdella, 2010; Willingham & Price, 2009) have analyzed data on students who were enrolled in developmental education in reading. In this multiyear, statewide investigation, the numbers and percentages of students enrolled in developmental education in reading at Texas 4-year universities decreased from the 2002-2003 to the 2009-2010 academic year. In this same time period, students who were enrolled in developmental education in reading and who completed a college-level course increased.

These results were consistent with Saxon et al. (2015) wherein the numbers of students enrolled in developmental education in reading have decreased over time. According to Saxon et al. (2015), these decreases may be the result of exemptions, such as passing exit-level examinations, that allow students to bypass developmental education courses. Unfortunately, with the exception of student enrollment in dual credit programs, these exemptions do not ensure that students are actually college ready. Such exemptions simply permit students to avoid developmental education courses even though they may need these courses to be successful in college. Saxon et al. (2015) also noted changes in the Texas Education Agency's Texas Success Initiative program that permitted individual institutions to dictate their own standards for college readiness. These individual variations in what constitutes college readiness may contribute to lower numbers of

students enrolled in developmental education. Saxon et al. (2015) suggested continued research to determine how students fared in college-level courses when they were exempted from developmental education courses. Although the lower numbers of students enrolled in developmental education courses might indicate improved college readiness, exemptions and changing standards obscure a full and accurate picture of true preparedness for college courses (Saxon et al., 2015).

### **Implication for Policy and Practice**

In this investigation, the numbers and percentages of students enrolled in developmental education in reading at Texas 4-year universities decreased from the 2002-2003 academic year though the 2009-2010 academic year. The percentages of students who enrolled in developmental education in reading and who completed a college-level course in reading increased over time. However, these improvements were limited and inconsistent over an 8-year period. Although institutions have measures in place to improve college readiness, most students enrolled in developmental education do not persist and graduate (Bailey, Jeong, & Cho, 2010). Universities must be more purposeful to determine the reasons why developmental education students are not succeeding at higher rates.

Changes in curriculum, college-readiness assessment, and instructional practices should be a priority for universities to improve success rates for developmental education students. Innovative developmental education courses may be more effective than traditional methods (Levin & Calcagno, 2007). Shorter courses that require less time to complete may encourage students to persist through them (Sheldon & Durdella, 2010). Also, increased evaluation of the validity of current college-readiness assessments and

the consideration of alternative-education options outside of a 4-year bachelor's degree should be investigated (Barnes & Slate, 2013).

### **Recommendations for Future Research**

In this multiyear, statewide investigation, the numbers and percentages of developmental education students in reading at Texas 4-year universities were examined. As such, researchers are encouraged to extend this investigation to developmental education students in mathematics, as well as to developmental education students in writing. Such analyses could be used to ascertain the degree to which the results reported herein are similar to developmental education in mathematics and in writing. Although the focus of this study was on 4-year universities in Texas, researchers should extend this study to 4-year universities in other states. The degree to which the results delineated herein are generalizable to developmental education students in other states is not known. Another suggestion for future research is to extend this investigation to developmental education students who are enrolled in community colleges. Would results obtained for 4-year university students be similar for developmental education students at community colleges? In addition to conducting such a study in Texas, researchers are encouraged to extend studies into community colleges in other states.

In this investigation, data were not available by student demographic characteristic. That is, the extent to which ethnicity/race and gender were related to developmental education student performance could not be determined. Researchers are encouraged to obtain individual student level data for future analyses. Investigations are also encouraged to examine different types of delivery methods of developmental education in reading, such as compressed courses, which are shorter in length, or

concurrent courses, which are designed to offer college-credit courses in tandem with developmental courses.

### **Conclusion**

The purpose of this research study was to determine the extent to which differences were present in the numbers and percentages of students enrolled in developmental education in reading at Texas 4-year universities from the 2002-2003 academic year through the 2009-2010 academic year. Statistically significant differences were present in all years of the study. The numbers and percentages of students enrolled in developmental education in reading decreased over time. Students who were enrolled in developmental education in reading and who completed a college-level course in reading increased during the years of the study. Consistent with Saxon et al. (2015), the numbers and percentages of students enrolled in developmental education in reading has decreased. However, readers should note the presence of many questions and concerns regarding the underlying reasons for these decreases.

Universities are tasked with assisting many students who are unprepared for college-level courses. In the 2003-2004 academic year of this study, nearly 35% of 4-year university students in Texas required developmental education in reading courses. Proficiency in reading is a cornerstone for college and career success (Stinnett, 2014); therefore, universities face a considerable responsibility to improve student reading skills. Educators and policymakers charged with developmental education will continue to encounter enormous challenges to increase college readiness among students who lack these skills.

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Table 2.1

*Descriptive Statistics for the Number of Students Below State Standards in Reading at Texas 4-year Universities From the 2002-2003 Through the 2009-2010 Academic Year*

Academic Year	<i>n</i> of 4-year universities	<i>M</i>	<i>SD</i>	Sum
2002-2003	31	204.13	246.42	6,328
2003-2004	32	225.19	287.56	7,206
2004-2005	31	219.97	263.24	6,819
2005-2006	31	183.48	222.16	5,688
2006-2007	32	136.91	160.05	4,381
2007-2008	32	164.38	179.46	5,260
2008-2009	34	142.97	170.45	4,861
2009-2010	36	131.53	166.28	4,735

Table 2.2

*Descriptive Statistics for the Percent of Developmental Education Students Who Met the TSI Obligation in Reading at Texas 4-year Universities From the 2002-2003 Through the 2009-2010 Academic Year*

Academic Year	<i>n</i> of 4-year universities	<i>M</i> %	<i>SD</i> %
2002-2003	31	68.13	19.21
2003-2004	30	65.87	18.31
2004-2005	30	67.77	20.97
2005-2006	31	75.83	14.55
2006-2007	31	77.71	13.10
2007-2008	31	83.76	15.44
2008-2009	32	71.68	21.36
2009-2010	33	75.74	17.84

Table 2.3

*Descriptive Statistics for the Average Number of Students Who Were Enrolled in Developmental Education in Reading in the 2002-2003 and the 2009-2010 Academic Year at Texas 4-year Universities*

Academic Year	<i>n</i> of 4-year universities	<i>M</i>	<i>SD</i>
2002-2003	31	204.13	246.42
2009-2010	31	152.22	170.50

Table 2.4

*Descriptive Statistics for the Average Percent of Students Who Were Enrolled in Developmental Education in Reading in the 2002-2003 and the 2009-2010 Academic Year at Texas 4-year Universities*

Academic Year	<i>n</i> of 4-year universities	<i>M</i> %	<i>SD</i> %
2002-2003	30	68.10	19.50
2009-2010	30	75.90	16.93

Table 2.5

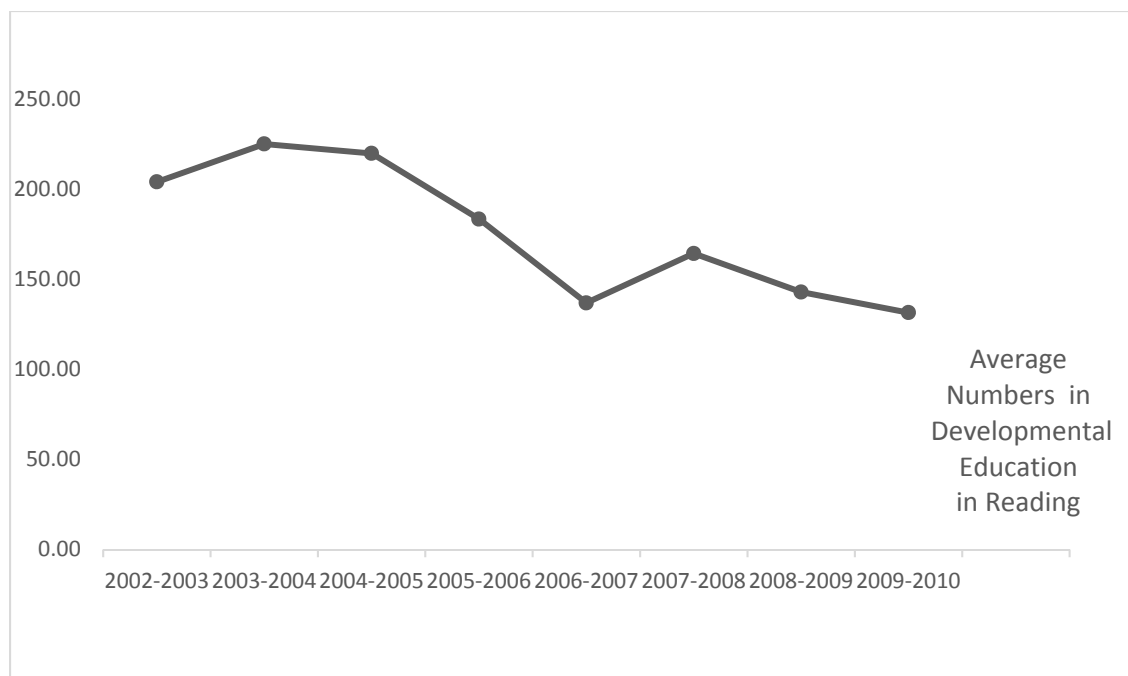
*Descriptive Statistics for the Percent of Developmental Education Students Who Earned a Grade of A, B, or C in a College-level Course in Reading at Texas 4-year Universities From the 2002-2003 Through the 2009-2010 Academic Year*

Academic Year	<i>n</i> of 4-year universities	<i>M</i> %	<i>SD</i> %
2002-2003	31	55.27	16.93
2003-2004	30	55.34	17.88
2004-2005	30	57.55	20.83
2005-2006	30	58.54	19.03
2006-2007	31	55.41	18.34
2007-2008	31	70.65	19.18
2008-2009	32	64.69	22.12
2009-2010	34	67.51	17.96

Table 2.6

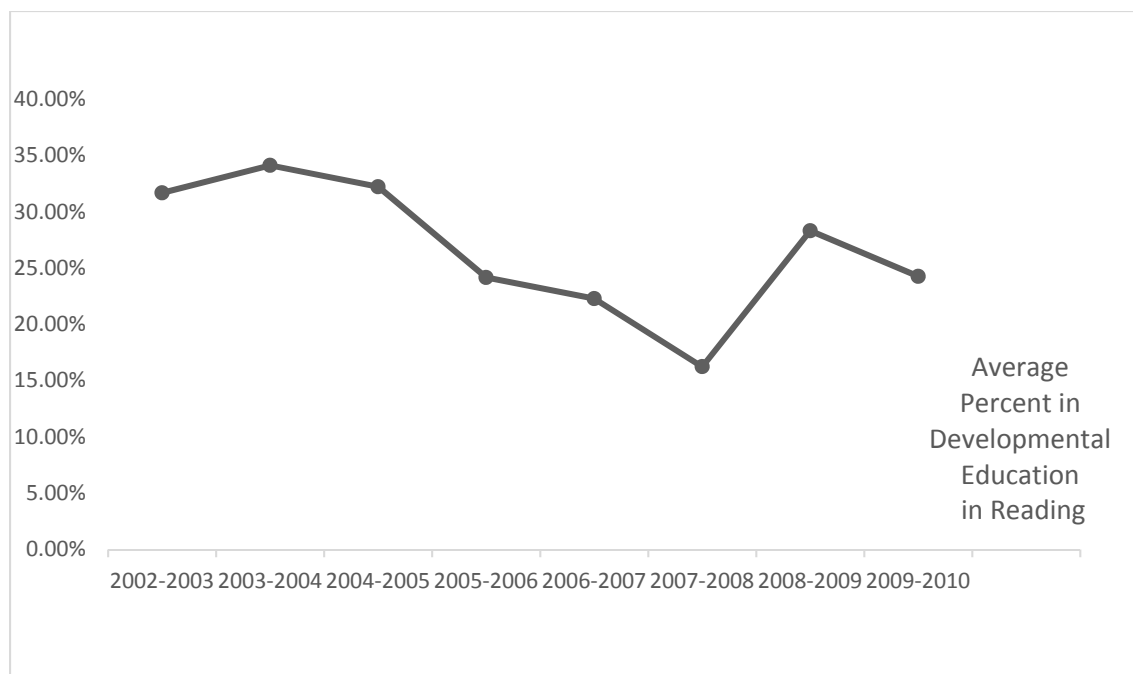
*Descriptive Statistics for the Percent of Students Enrolled in Developmental Education in Reading at Texas 4-year Universities and Who Completed a College-level Course in Reading in the 2002-2003 and 2009-2010 Academic Year*

Academic Year	<i>n</i> of 4-year universities	<i>M%</i>	<i>SD%</i>
2002-2003	30	55.45	17.19
2009-2010	30	67.02	14.85

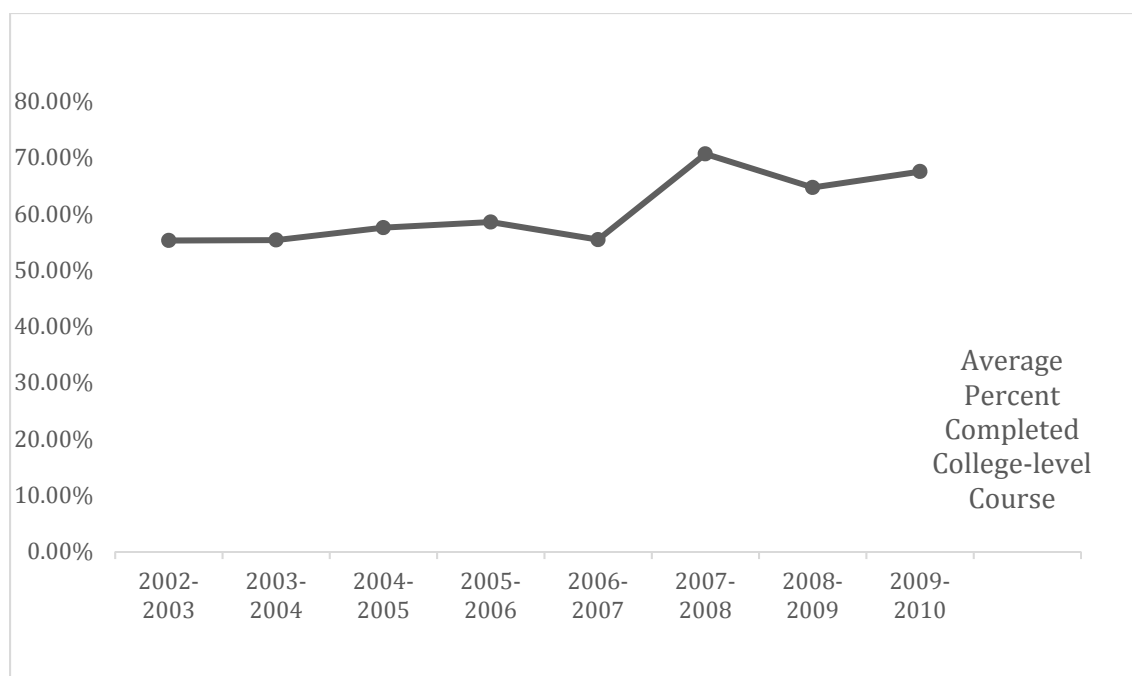


*Figure 2.1.* Average numbers of students who were enrolled in developmental education in reading at Texas 4-year universities for the 2002-2003 through the 2009-2010 academic years.





*Figure 2.2.* Average percent of students who were enrolled in developmental education in reading at Texas 4-year universities for the 2002-2003 through the 2009-2010 academic years.



*Figure 2.3.* Average percent of students who were enrolled in developmental education in reading and who completed a college-level course in reading at Texas 4-year universities for the 2002-2003 through the 2009-2010 academic years.

### CHAPTER III

## DIFFERENCES IN DEVELOPMENTAL EDUCATION ENROLLMENT AND MATHEMATICS PERFORMANCE AT TEXAS 4-YEAR UNIVERSITIES: A MULTIYEAR, STATEWIDE STUDY

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This dissertation follows the style and format of *Research in the Schools (RITS)*.

### **Abstract**

In this study, the numbers and percentages of students enrolled in developmental education in mathematics at Texas 4-year universities were calculated for the 2002-2003 through the 2009-2010 academic years. Determined in this investigation were the increases and decreases in the numbers and percentages of students enrolled in developmental education in mathematics and whether differences were present in these statistics over an 8-year time period. A particular emphasis in this investigation was on the completion of a college-level course in mathematics by students who were enrolled in developmental education in mathematics. Revealed in this multiyear investigation were statistically significant differences in the numbers of students enrolled in developmental education in mathematics and in the percentages of those students who then completed a college-level course in mathematics. However, the percentages of students enrolled in developmental education in mathematics were not statistically significant over time. Although the numbers of students enrolled in developmental education in mathematics decreased over time, about 60% did not complete a college-level course in mathematics. Readers are provided with implications for practice and recommendations for future research.

**Keywords:** Developmental education, mathematics, Texas, 4-year universities, college-level course

## DIFFERENCES IN DEVELOPMENTAL EDUCATION ENROLLMENT AND MATHEMATICS PERFORMANCE AT TEXAS 4-YEAR UNIVERSITIES: A MULTIYEAR, STATEWIDE STUDY

Earning a college degree is an increasingly expensive endeavor. Since the mid 1980s, the college education inflation rate has risen a staggering 500%, while the consumer price index has increased a mere 115% (Odland, 2012). Despite recent criticisms and concerns about the exorbitant cost of college, college graduates continue to enjoy its benefits by having “larger earnings over a lifetime, lower unemployment rates, better health, higher marriage rates, and greater civic involvement” (Rose, 2013, p. 25). A Pew Research Center (2011) survey indicated that 94% of adults had the expectation their own children would attend college, and 86% of adults confirmed their own college degrees were money well spent. Regardless of its high price tag, a 4-year college degree continues to be a part of the coveted American Dream, the desire for financial independence, home ownership, and sustainable employment.

Recent statistics regarding the benefits of a college degree support these ideas. The National Center for Education Statistics (2013) reported that individuals ages 25-34 with a bachelor’s degree, the rate of unemployment in 2012 was only 4.1%. In contrast, nearly 13% of that same age group lacking a college degree were unemployed. Karageorge (2014) agreed that tolerance for the cost of a college degree was due to its continued success as a valuable asset. Between 1970 and 2013, individuals who held a bachelor’s degree earned an average of 56% more than high school graduates. Gee and Hawk (2015) identified even less obvious benefits of a college degree. College graduates are more likely to read to their own children, have lower rates of obesity and smoking,

and are less likely to be incarcerated (Gee & Hawk, 2015). Therefore, achieving a college degree contributes to a society that is employed, financially stable, health conscious, and family oriented.

### **College Readiness in Mathematics**

College readiness, or the lack thereof, is hindering the pursuit of a 4-year college degree for many students. The ACT (2013) reported that only 25% of students were college ready. Gallard, Albritton, and Morgan (2010) emphasized that college readiness is one of the most critical factors in predicting students' abilities to experience success during college. However, with at least half of all entering college students unprepared for college course work (Bailey, 2009), and 20% of 4-year college entrants requiring remedial education and dropping out after only one year (Steinberg, 2014), college-readiness is a crisis.

Abraham, Slate, Saxon, and Barnes (2014) recently investigated the college-readiness crisis specifically as it pertains to mathematics. Abraham et al. (2014) documented that nearly 42% of Texas college students in 2008 were not college ready in mathematics. Unfortunately, over a 3-year period, a lack of any substantial increase in college-readiness scores in mathematics for students who were first time in college (FTIC) was demonstrated, indicating that readiness efforts attempted by K-12 and college educators were unsuccessful. In contrast, FTIC students who were college ready in mathematics had a much higher rate of passing a college-level mathematics course within one year than FTIC students who were not college ready (Abraham et al., 2014). Differences in college readiness in mathematics could likely affect student success, persistence rates, and graduation rates.

Other researchers (e.g., Barnes & Slate, 2011; Barnes & Slate, 2013; Combs et al., 2010; Saxon, Slate, & Barnes, 2015) have also determined that college-readiness in mathematics is in crisis. Saxon et al. (2015) documented that only about 40% of Texas college students met the state's mathematics readiness standard in 2007. When considering students by ethnicity/race, Black and Hispanic students have statistically significantly lower college readiness rates in mathematics than do White students (Barnes & Slate, 2011). Focusing on student gender, Combs et al. (2010) established that boys scored higher on examinations measuring college readiness in mathematics than girls, which presents a worrisome gap of achievement. Finally, Barnes and Slate (2013) suggested that America's effort to keep pace with global scientific and technological achievements in the 1950s and 1960s was one cause for current ineffective college-readiness measurements in mathematics. These well-intentioned efforts led both to misguided policies for measuring college readiness and to lacking remedies for improving college readiness in mathematics.

Proficiency in mathematics is one critical area where American college students are ill-equipped for college-level courses. Hodara (2013) suggested that several interventions were necessary to improve mathematics college readiness among U.S. students, including better pre-matriculation programs for high school students, reformed developmental mathematics programs, and new teaching strategies in mathematics classrooms. Lacking mathematics skills could have serious implications for American workers in a competitive global economy where mathematical skills were often required when applicants seek jobs (Bailey & Borwein, 2012; Carnegie Institute, 2009). College

students and graduates must be well prepared for a job force that demands adept mathematical skills or they risk being left behind in a changing economy.

Some educators and administrators blame secondary institutions for college-readiness deficiencies. Harrigan and Davies (2012) contended that a high school education “is now wasted taxpayer money; another \$80,000 investment is necessary to cover college tuition and fees. And a healthy portion of this investment is spent teaching college students what they should have already learned” (p. 1). Steinberg (2014), a psychology professor at Temple University and a harsh critic of American high schools, reported that over the last 40 years, 17-year-old high school students have made no progress on their mathematics subject-area tests. In an effort to raise high school accountability, state agencies are requiring higher standards and increased reported of specific indicators. In Texas, the Texas Education Agency (2016) has called for the reporting of college-readiness indicators and set criteria for grading school campuses based on their successes achieving the indicators. However, many of these efforts by states continue to fail to increase the numbers of students who are college ready.

Poor mathematics performance in college may be linked to other factors related to secondary schools. The onset and popularity of block scheduling was one reason cited. Zelkowski (2010) suggested that mathematics students experienced detrimental breaks in their instruction with block scheduling, which oftentimes allowed students to take a mathematics class only once a year and for one semester. This months-long interruption could inhibit continuous mathematics instruction for struggling students. Furthermore, lacking college readiness in mathematics may be caused by student inability to achieve mastery in basic high school courses, such as algebra. Corbishley and Truxaw (2010)



noted results of a mathematics faculty survey that provided some indication about the severity of inadequate college readiness among students. According to faculty surveyed, only about 9% believed that their freshmen students were prepared for their first mathematics course. One faculty member replied that “Too many need to retake second, and even first, year high school algebra. Those who don’t need those remedial classes are typically just adequate in algebra skills except incoming math and science majors” (Corbishley & Truxaw, 2010, p. 76). Latterell and Frauenholtz (2007) reported that college readiness in mathematics was a complex issue and rooted in a variety of causes.

### **Persistence as a Function of Developmental Education**

A large portion of higher education institutional planning is centered on retaining students (Claybrooks & Taylor, 2016). Student persistence, which refers to students transitioning from one year to the next year (Texas Higher Education Coordinating Board, 2012), is at a crossroads in higher education. At 4-year public institutions, the dropout rate is 42%, indicating that within six years, first-time, full-time students had not graduated with a bachelor’s degree. At less selective institutions with open admissions, the dropout rate is even higher at 63% (National Center for Education Statistics, 2016). When considering students by ethnicity/race, dropout rates among Hispanic and Black students are alarmingly high and exceed the dropout rates of White students (Spangler & Slate, 2015). Two reasons cited for the higher dropout rates of Hispanic and Black students are financial challenges and family obligations (Witkow, Huynh, & Fuligni, 2015). Therefore, colleges invest many resources to determine how to improve student retention for a diverse student population.

Strategies to enhance student persistence range from the required first-year experience course to extensive efforts to integrate students into college social and academic life (Claybrooks & Taylor, 2016). Because so many students arrive on college campus lacking academic skills, institutions focus on remediation as one method to retain students to improve persistence (Stewart, Lim, & Kim, 2015). Developmental education courses are a primary component of focused remediation. The goal of these courses is to improve academic proficiency so that students could enroll in credit-bearing courses.

However, Clark, Slate, Moore, and Barnes (2015) determined that developmental education did not positively influence persistence or graduation rates over a 3-year period for White, Black, and Hispanic students. Through a review of the literature, Clark et al. (2015) identified several developmental education challenges, including inconsistencies about the definition of college readiness, unreliable placement test scores as the sole indicator of college readiness, and debates about whether high schools or colleges should deliver developmental education. Also, Abraham et al. (2014) documented that over a 3-year period, the average mean percentage of students who had taken a developmental mathematics course and then passed a college-level mathematics course with at least a “C” was less than 6%. When Abraham et al. (2014) examined college readiness in one of those years, 2008, nearly the same percentage of FTIC students were deemed college ready in mathematics as FTIC students who were enrolled in developmental courses in mathematics. Therefore, discrepancies exist between high school and college definitions of college readiness. Unfortunately, students taking developmental courses were much less likely to complete college with a degree than were students who never required developmental education (Bailey, Jeong, & Cho, 2010). Developmental education

courses as a strategy to improve persistence and retention have been unsuccessful for most students.

To improve persistence rates as a result of developmental education courses, institutions are attempting different formats. One method attempted is to provide students the opportunity to take developmental courses and college-level course concurrently (Mangan, 2014). Also, expediting the time frame and reorganizing the curriculum into a more compact design is another method of developmental courses used by some institutions (Edgecombe, 2011). These accelerated courses allow students to complete both the developmental course portion while completing the college-level course requirements (Jaggars, Hodara, Cho, & Xu, 2015). Reforms such as the accelerated developmental courses require faculty to design courses with end goals in mind and to determine evidence of achievement in advance (Walker, 2015). These new methods of delivery hold promise to improve persistence rates among the most struggling students.

### **Statement of the Problem**

The President's Council of Advisors on Science and Technology (2017) called for an improvement in student skills in science, technology, engineering, and mathematics (STEM) to keep pace in an economically competitive society and for 100,000 teachers to be trained in STEM over the next decade. This plea may originate in the fact that only 44% of high school graduates in 2013 were college ready in mathematics (National Math Science Initiative, 2016). To that end, an imperative exists to improve college readiness in mathematics.

Hispanic and Black students, in particular, need additional support and different teaching styles at both the secondary and postsecondary levels to achieve college-level proficiency in mathematics (Houser & An, 2015). Unfortunately, many Hispanic and Black students attend high schools with scant resources and unqualified teachers, making mathematics achievement a difficult task (Atuahene & Russell, 2016). Foltz, Gannon, and Kirschmann (2014) suggested more Hispanic and Black students should be encouraged to choose STEM majors by utilizing enhanced and varied recruitment and persistence efforts.

Struggling students with poor mathematics skills rely on developmental education courses to improve their proficiency so they can progress to college-level mathematics courses. However, developmental courses are largely unsuccessful for many students (Bailey et al., 2010). In 2008, nearly 95% of Texas students who completed a developmental mathematics course could not pass a first-year, college-level mathematics course (Abraham et al., 2014). Although remediation in mathematics is needed, only marginal success has been achieved through developmental education courses.

### **Purpose of the Study**

The purpose of this research study was to identify the numbers and percentages of students who were enrolled in developmental education in mathematics at Texas 4-year universities during the 2002-2003 through the 2009-2010 academic years. A second purpose was to determine the degree to which the numbers and percentages of students who were enrolled in developmental education in mathematics changed from the 2002-2003 through the 2009-2010 academic years in Texas 4-year universities. A third purpose was to ascertain the extent to which student completion of a college-level course

in mathematics changed between the 2003 and the 2010 academic years. The final purpose of this research study was to determine the degree to which a trend might be present both in the numbers and percentages of students who were enrolled in developmental education in mathematics, as well as in student completion of a college-level course in mathematics, during the 2002-2003 through the 2009-2010 academic years. Given the importance of improving mathematics readiness and student retention, an imperative exists to determine the relationship between developmental course enrollment in mathematics and student success.

### **Significance of the Study**

Few researchers have focused their efforts on the relationship between developmental course enrollment in mathematics and college-level mathematics course completion at Texas 4-year universities over time. Subsequently, trends in achievement and persistence can be determined by examining the differences in student performance of those individuals who enroll in a developmental mathematics course and then their ensuing completion of a college-level mathematics course. Educational leaders at both the secondary and postsecondary levels may identify possible strategies for combatting lacking college readiness in mathematics. Because many of the 21st century employment opportunities will demand mathematics proficiency, an imperative exists to improve college readiness in mathematics. By determining the connection between developmental course enrollment in mathematics and student persistence by way of college-course completion, focused decision making by educational leaders regarding remediation efforts and developmental course design can be improved, and students can achieve success by persisting and graduating.

## Research Questions

In this investigation, the research questions examined were: (a) What are the numbers of students who were enrolled in developmental education in mathematics at Texas 4-year universities for the 2002-2003 through the 2009-2010 academic years?; (b) What are the percentages of students who were enrolled in developmental education in mathematics at Texas 4-year universities for the 2002-2003 through the 2009-2010 academic years?; (c) What is the difference in the average number of students who were enrolled in developmental education mathematics at Texas 4-year universities between the 2002-2003 and 2009-2010 academic years?; (d) What is the difference in the average percent of students who were enrolled in developmental education mathematics at Texas 4-year universities between the 2002-2003 and the 2009-2010 academic years?; (e) What are the percentages of students who were enrolled in developmental education in mathematics and completed a college-level course in mathematics in the 2002-2003 through the 2009-2010 academic years?; (f) What is the difference in the percentage of students who were enrolled in developmental education mathematics at Texas 4-year universities and who completed a college-level course in mathematics between the 2002-2003 and the 2009-2010 academic years?; (g) What trend is present, if any, in the numbers of students who were enrolled in developmental education in mathematics at Texas 4-year universities during the 2002-2003 through the 2009-2010 academic years?; (h) What trend is present, if any, in the percentages of students who were enrolled in developmental education in mathematics at Texas 4-year universities during the 2002-2003 through the 2009-2010 academic years?; and (i) What trend is present, if any, in the percentages of students who were enrolled in developmental education in mathematics

and who completed a college-level course in mathematics at Texas 4-year universities during the 2002-2003 through the 2009-2010 academic years?

## **Method**

### **Research Design**

A longitudinal, explanatory design was utilized for this research article (Johnson, 2001). In this study, the individual variables had already occurred and extraneous variables were not controlled (Johnson & Christensen, 2012). Archival data from the Texas Higher Education Coordinating Board were utilized to examine the previously mentioned research questions. Accordingly, the independent variables in this research article were the academic years: 2002-2003 through 2009-2010. The three dependent variables were the number of students enrolled in developmental education mathematics courses, the percentage of students enrolled in developmental education mathematics courses, and the percentage of students who passed a college-level mathematics course with an A, B, or C.

### **Participants and Instrumentation**

Archival data from the 2002-2003 through the 2009-2010 academic years were downloaded from the Texas Higher Education Coordinating Board Interactive Accountability System (2016). These data reflected all students at Texas 4-year universities who were first enrolled in a developmental education course and subsequently enrolled in a college-level course in mathematics. The success of students based on developmental course enrollment in mathematics and passing a college-level course in mathematics was analyzed from data collected from 4-year universities in Texas from the 2002-2003 through the 2009-2010 academic years. Data were not

available for some universities in some instances; however, all available data were analyzed.

The Texas Higher Education Coordinating Board Interactive Accountability System (2016) data were used for this research study. This system is used to track performance of Texas universities on important matters in higher education. For this research investigation, data were analyzed that specifically pertains to students enrolled in developmental education courses in mathematics at 4-year Texas universities. Developmental education is defined by the Texas Higher Education Coordinating Board as “courses, tutorials, laboratories, or other efforts to bring students’ skill levels in reading, writing, and mathematics to entering college level” (2012, p. 25). Only those college-level courses completed with a grade of A, B, or C were analyzed. Regarding developmental course completion and subsequent college-level course completion, inferential statistical methods were used to identify any existing trends from the 2002-2003 through the 2009-2010 academic years.

## **Results**

Regarding the first research question, descriptive statistics were calculated for the numbers of students who were enrolled in developmental education in mathematics at Texas 4-year universities for the 2002-2003 academic year through the 2009-2010 academic year. The 2003-2004 academic year had the most students ( $n = 9,340$ ) who were enrolled in developmental education in mathematics. In the 2006-2007 academic year, the fewest number of students ( $n = 5,912$ ) were enrolled in developmental education in mathematics. In the 2003-2004 academic year, the highest average ( $M = 291.88$ ) number of students were enrolled in developmental education in mathematics, and in the



2009-2010 academic year, the lowest average ( $M = 182.72$ ) were enrolled. Readers are directed to Table 3.1 for these descriptive statistics for the numbers of students who were enrolled in developmental education in mathematics in Texas 4-year universities from the 2002-2003 through the 2009-2010 academic year.

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Insert Table 3.1 about here

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For the second research question, data available on the Texas Higher Education Coordinating Board Interactive Accountability System were not the percentages of students who were enrolled in developmental education in mathematics. Rather, the available data were percentages of students who were not enrolled in developmental education in mathematics. Reflected in Table 3.2 are the descriptive statistics for the percentages of students who were enrolled in developmental education in mathematics.

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Insert Table 3.2 about here

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Because the second research question was directed at the percentages of students who were enrolled in developmental education in mathematics, average percentages were subtracted from 100% in each academic year. These calculations produced the percentages of students who were enrolled in developmental education in mathematics. In the 2004-2005 academic year, the highest average percentage of students ( $M = 47.84\%$ ) were enrolled in developmental education in mathematics. In the 2007-2008 academic year, the lowest average percentage of students ( $M = 31.59\%$ ) were enrolled in

developmental education. Of particular interest was that approximately 41% of students continued to be enrolled in developmental education in mathematics in the most recent academic year of data, 2009-2010.

To answer research question three, inferential statistics were conducted to determine whether differences were present in the average number of students who were enrolled in developmental education in mathematics between the 2002-2003 academic year and the 2009-2010 academic year at Texas 4-year universities. Checks were conducted to determine the extent to which these data were normally distributed (Onwuegbuzie & Daniel, 2002). A decision was made to use a parametric dependent samples *t*-test to answer the third research question despite some of the values not being normally distributed. Between the 2002-2003 and the 2009-2010 academic years, the parametric dependent samples *t*-test revealed a statistically significant difference in the average number of students who were enrolled in developmental education in mathematics,  $t(30) = 2.72, p < .001$ . This difference represented a small effect size (Cohen's *d*) of 0.31 (Cohen, 1988). In the 2009-2010 academic year, nearly 27% fewer developmental education students were enrolled in mathematics than in the 2002-2003 academic year. Table 3.3 contains the descriptive statistics for this analysis.

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 Insert Table 3.3 about here  
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To answer research question four, checks were conducted to determine the extent to which these data were normally distributed (Onwuegbuzie & Daniel, 2002) prior to conducting inferential statistics to ascertain whether differences were present in the

average percent of students who were enrolled in developmental education in mathematics between the 2002-2003 academic year and the 2009-2010 academic year at Texas 4-year universities. Even though some of the values were reflective of non-normal data, a parametric dependent samples *t*-test was used to answer the fourth research question. The parametric dependent samples *t*-test did not reveal a statistically significant difference in the average percent of students who were enrolled in developmental education in mathematics,  $t(29) = -1.35, p = .19$  between the 2002-2003 academic year and the 2009-2010 academic year at Texas 4-year universities. The average percentages of students who were enrolled in developmental education in mathematics in the 2002-2003 academic year and in the 2009-2010 academic year were similar, within 6%. Described in Table 3.4 are the descriptive statistics for this analysis.

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 Insert Table 3.4 about here  
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Regarding the fifth research question, descriptive statistics were calculated for the percentages of students who were enrolled in developmental education in mathematics and who completed a college-level course in mathematics at Texas 4-year universities for the 2002-2003 academic year through the 2009-2010 academic year. The lowest average percentage of these students was 31% in the 2004-2005 academic year and the highest percentage was 44% in the 2008-2009 academic year. Readers should note an increase from the 2006-2007 academic year to the 2009-2010 academic year, where 10% more students completed a college-level course in mathematics. In the last academic year of data analyzed, the percentages of students who had completed a college-level course in

mathematics decreased slightly from the previous year. Readers are directed to Table 3.5 for these descriptive statistics.

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Insert Table 3.5 about here  
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To answer research question six, prior to conducting inferential statistics to determine whether a difference was present in the percentage of students who were enrolled in developmental education in mathematics and who completed a college-level course in mathematics between the 2002-2003 academic year and the 2009-2010 academic year at Texas 4-year universities, checks were conducted to determine the extent to which these data were normally distributed (Onwuegbuzie & Daniel, 2002). Although some of the values were indicative of non-normally distributed data, a parametric dependent samples *t*-test was used to answer this research question. A statistically significant difference was yielded in the percentage of students who were enrolled in developmental education in mathematics and who completed a college-level course in mathematics,  $t(29) = -2.63, p < .001$ , between the 2002-2003 academic year and the 2009-2010 academic year at Texas 4-year universities. This difference represented a moderate effect size (Cohen's *d*) of 0.60 (Cohen, 1988). In the 2009-2010 academic year, a statistically significantly higher percentage of students were enrolled in developmental education in mathematics and completed a college-level course in mathematics than in the 2002-2003 academic year. Reflected in Table 3.6 are the descriptive statistics for this analysis.

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Insert Table 3.6 about here  
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An analysis of trends of all eight years of data was conducted to answer research questions seven, eight, and nine. With respect to research question seven as shown in Figure 3.1, trends were present in the average numbers of students enrolled in developmental education in mathematics at Texas 4-year universities for the 2002-2003 through the 2009-2010 academic years. From the 2003-2004 academic year to the 2006-2007 academic year, the average numbers of students enrolled in developmental education in mathematics decreased by 37%. However, the average numbers of students enrolled in developmental education in mathematics increased by over 10% from the 2006-2007 academic year to the final year of this study.

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Insert Figure 3.1 about here  
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To answer research question eight, trends were present in the average percentages of students who were enrolled in developmental education in mathematics at Texas 4-year universities from the 2002-2003 through the 2009-2010 academic years. As revealed in Figure 3.2, similar average percentages of students were enrolled in developmental education in mathematics in the first three academic years of this investigation. However, in the 2005-2006 academic year, the average percentages of students enrolled in developmental education in mathematics began to decrease. Over the 8-year period of this study, the 2007-2008 academic year represented the lowest

average percentage of students enrolled in developmental education in mathematics, a 34% decrease from the highest average percentage in the 2004-2005 academic year.

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Insert Figure 3.2 about here

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Regarding research question nine, the average percentages of students who were enrolled in developmental education in mathematics and who completed a college-level course in mathematics at Texas 4-year universities in the 2002-2003 through the 2009-2010 academic years were determined. As depicted in Figure 3.3, the average percentages of students were enrolled in developmental education in mathematics and completed a college-level course in mathematics in the first five academic years of this investigation were similar. In the 2007-2008 academic year, however, the average percentage of students who were enrolled in developmental education in mathematics and who completed a college-level course in mathematics increased 10%. The average percentages of students in the final three years of the study remained approximately 10% higher than those average percentages in the first five years of the study.

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Insert Figure 3.3 about here

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### **Discussion**

In this investigation, data were analyzed on students who were enrolled in developmental education in mathematics at Texas 4-year universities in the 2002-2003 through the 2009-2010 academic years. Data obtained from the Texas Higher Education

Coordinating Board Interactive Accountability System were analyzed over an 8-year period. In this study from the 2002-2003 through the 2009-2010 academic years, at least 29 Texas 4-year universities provided data that were analyzed.

For the eight academic years of data that were analyzed, statistically significant differences were present in the numbers of students who were enrolled in developmental education in mathematics. In this investigation, the average number of students enrolled in developmental education in mathematics was the lowest ( $n = 5,912$ ) in the 2006-2007 academic year and the highest ( $n = 9,340$ ) in the 2003-2004 academic year. Statistically significant differences were not present, however, in the percentages of students who were enrolled in developmental education in mathematics. The average percentage of students enrolled in developmental education in mathematics was the lowest, 32%, in the 2007-2008 academic year and the highest, 48%, in the 2004-2005 academic year. Statistically significant differences also were present for the percentages of students enrolled in developmental education in mathematics and who completed a college-level course in mathematics. The average percentage of students who were enrolled in developmental education in mathematics and who completed a college-level course in mathematics was the lowest, 31%, in the 2004-2005 academic year and the highest, 44%, in the 2008-2009 academic year.

### **Connections with Existing Literature**

Previous researchers (Abraham et al., 2014; Chingos, 2016; Hodara, 2013; Latterell & Frauenholtz, 2007; Saxon et al., 2015) have analyzed data on students who were enrolled in developmental education in mathematics. In this multiyear, statewide investigation, the numbers of students enrolled in developmental education in

mathematics at Texas 4-year universities decreased by 27% from the 2002-2003 to the 2009-2010 academic year. In this same period, students who were enrolled in developmental education in mathematics and who completed a college-level course increased by 12%. These results were somewhat more positive than the results of Abraham et al. (2015) wherein the numbers and percentages of students enrolled in developmental education in mathematics at community colleges in Texas remained essentially the same over time, showing minimal improvement. In the Abraham et al. (2015) study, only about 5% of students who were enrolled in developmental education in mathematics went on to complete a college-level course in mathematics within three years. This extremely low success rate was interpreted to mean that mandated, state-level initiatives designed to improve mathematics skills for developmental education students at community colleges were failing, and policymakers must reevaluate the efficiency and effectiveness of those initiatives (Abraham et al., 2015).

### **Implication for Policy and Practice**

In this analysis, the numbers and percentages of students enrolled in developmental education in mathematics at Texas 4-year universities decreased from the 2002-2003 academic year to the 2009-2010 academic year. The percentages of students who enrolled in developmental education in mathematics and who completed a college-level course in mathematics increased over time. However, this improvement was only 10% higher over an 8-year period. In the final year of this study, nearly 60% of students had not completed a college-level course in mathematics. Both Texas community colleges and 4-year universities must work more diligently to develop developmental



courses in mathematics that provide students with additional opportunities for success in college-level courses.

Abraham et al. (2015) suggested that Texas lawmakers reconsider their stance on Common Core State Standards to ensure that more secondary students are prepared for college-level mathematics. Also, investigations into programs such as the Achieving the Dream Developmental Education Initiative might be in order, considering the improvements in mathematics shown by participating community colleges (Abraham et al., 2015). Chingos (2016) emphasized the importance of quality instruction in college-level mathematics courses as it related to successful student outcomes. Improved faculty evaluation tools may provide feedback that could improve student success in college-level mathematics courses (Chingos, 2016).

### **Recommendations for Future Research**

In this multiyear, statewide investigation, the numbers and percentages of developmental education students in mathematics at Texas 4-year universities were examined. As such, this investigation could be extended to developmental education students in reading and in writing. These analyses could determine similarities or differences among results reported herein to developmental education in reading and in writing. Although Texas 4-year universities were the focus of this study, researchers should extend the study to 4-year universities in other states. Whether the results delineated herein are generalizable to students in developmental education in other states is not known. Extending this investigation to community colleges would be another suggestion for future research. Would results obtained from community colleges be

different when compared to the results of this study? Researchers are also encouraged to extend this study to community colleges in other states.

Student demographic characteristics and their relationships to student enrollment and student success in developmental education were not considered in this investigation.. Researchers are encouraged to examine the extent to which ethnicity/race and gender were related to developmental education student performance. Different types of delivery methods of developmental education exist, such as compressed courses, and researchers are encouraged to investigate the extent to which various methods of delivery is related to student performance.

### **Conclusion**

The purpose of this research study was to determine the extent to which differences were present in the numbers and percentages of students enrolled in developmental education in mathematics at Texas 4-year universities from the 2002-2003 academic year through the 2009-2010 academic year. The numbers and percentages of students enrolled in developmental education in mathematics decreased over time; however, the percentages were not statistically significant. Students who were enrolled in developmental education in mathematics and who completed a college-level course in reading increased during the years of the study. Still, nearly 60% of those students did not complete a college-level course in mathematics in the final year of the study. This high percentage of developmental education students failing to complete a college-level course in mathematics is consistent with Abraham et al. (2015). Readers should note that although numbers and percentages of students enrolled in developmental education in mathematics have decreased, many questions and concerns exist regarding why so many

of these students are not experiencing higher success rates in college-level mathematics courses.

Saxon et al. (2015) determined that among Texas college students, only about 40% were deemed college ready in mathematics according to the state's readiness standard in 2007. When students attempt to move from developmental courses in mathematics to college-level courses in mathematics, most students are not successful. In a global economy, lack of mathematics proficiency could present challenges for employment opportunities for workers seeking stable, well-paying jobs (Bailey & Borwein, 2012). Universities must take on the formidable responsibility of improving student mathematics skills. Developmental education policymakers must continue to reassess their programs to provide high-quality developmental education for students who struggle in mathematics.

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Table 3.1

*Descriptive Statistics for the Number of Students Below State Standards in Mathematics  
at Texas 4-year Universities From the 2002-2003 Through the 2009-2010 Academic Year*

Academic Year	<i>n</i> of 4-year universities	<i>M</i>	<i>SD</i>	Sum
2002-2003	31	289.00	308.72	8,959
2003-2004	32	291.88	319.26	9,340
2004-2005	31	272.94	280.31	8,461
2005-2006	31	243.39	220.81	7,545
2006-2007	31	190.71	181.48	5,912
2007-2008	31	212.32	184.43	6,582
2008-2009	34	209.79	185.37	7,133
2009-2010	36	182.72	179.98	6,578

Table 3.2

*Descriptive Statistics for the Percent of Developmental Education Students Who Met the TSI Obligation in Mathematics at Texas 4-year Universities From the 2002-2003 Through the 2009-2010 Academic Year*

Academic Year	<i>n</i> of 4-year universities	<i>M</i> %	<i>SD</i> %
2002-2003	31	46.66	22.93
2003-2004	30	47.74	19.06
2004-2005	30	47.84	19.39
2005-2006	30	37.48	16.74
2006-2007	31	37.17	16.54
2007-2008	31	31.59	18.13
2008-2009	32	40.07	21.95
2009-2010	33	41.11	21.25

Table 3.3

*Descriptive Statistics for the Average Number of Students Who Were Enrolled in Developmental Education in Mathematics in the 2002-2003 and the 2009-2010 Academic Year at Texas 4-year Universities*

Academic Year	<i>n</i> of 4-year universities	<i>M</i>	<i>SD</i>
2002-2003	31	289.00	308.72
2009-2010	31	210.13	179.34

Table 3.4

*Descriptive Statistics for the Average Percent of Students Who Were Enrolled in Developmental Education in Mathematics in the 2002-2003 and the 2009-2010 Academic Year at Texas 4-year Universities*

Academic Year	<i>n</i> of 4-year universities	<i>M</i> %	<i>SD</i> %
2002-2003	30	52.62	22.96
2009-2010	30	58.42	21.80

Table 3.5

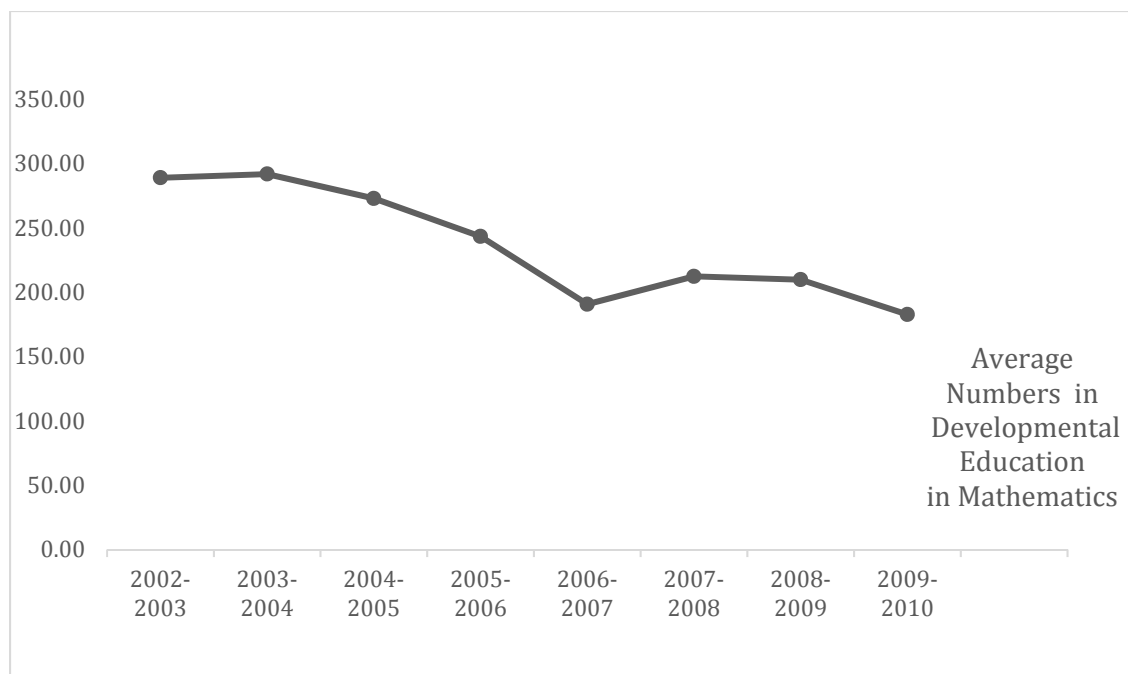
*Descriptive Statistics for the Percent of Developmental Education Students Who Earned a Grade of A, B, or C in a College-level Course in Mathematics at Texas 4-year Universities From the 2002-2003 Through the 2009-2010 Academic Year*

Academic Year	<i>n</i> of 4-year universities	<i>M</i> %	<i>SD</i> %
2002-2003	31	32.12	20.35
2003-2004	30	33.74	15.81
2004-2005	29	31.27	11.68
2005-2006	30	36.42	13.98
2006-2007	31	31.73	10.76
2007-2008	30	41.81	14.17
2008-2009	32	44.02	20.80
2009-2010	34	41.79	16.20

Table 3.6

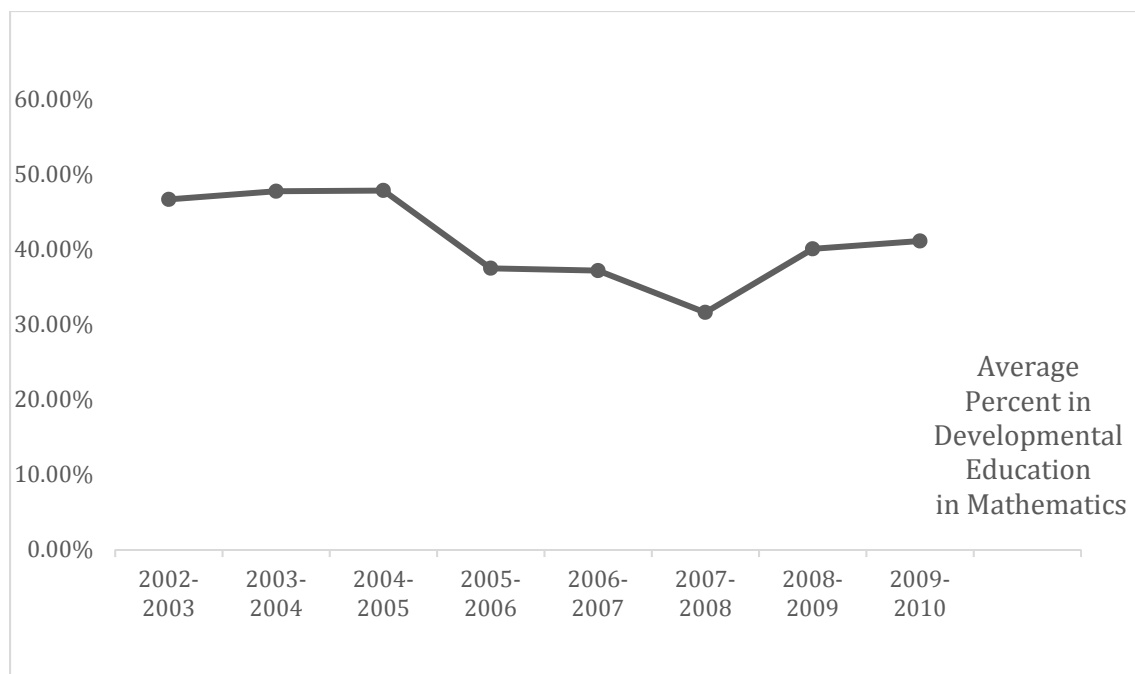
*Descriptive Statistics for the Percent of Students Enrolled in Developmental Education in Mathematics at Texas 4-year Universities and Who Completed a College-level Course in Mathematics in the 2002-2003 and 2009-2010 Academic Year*

Academic Year	<i>n</i> of 4-year universities	<i>M</i> %	<i>SD</i> %
2002-2003	30	30.69	19.05
2009-2010	30	40.52	13.27

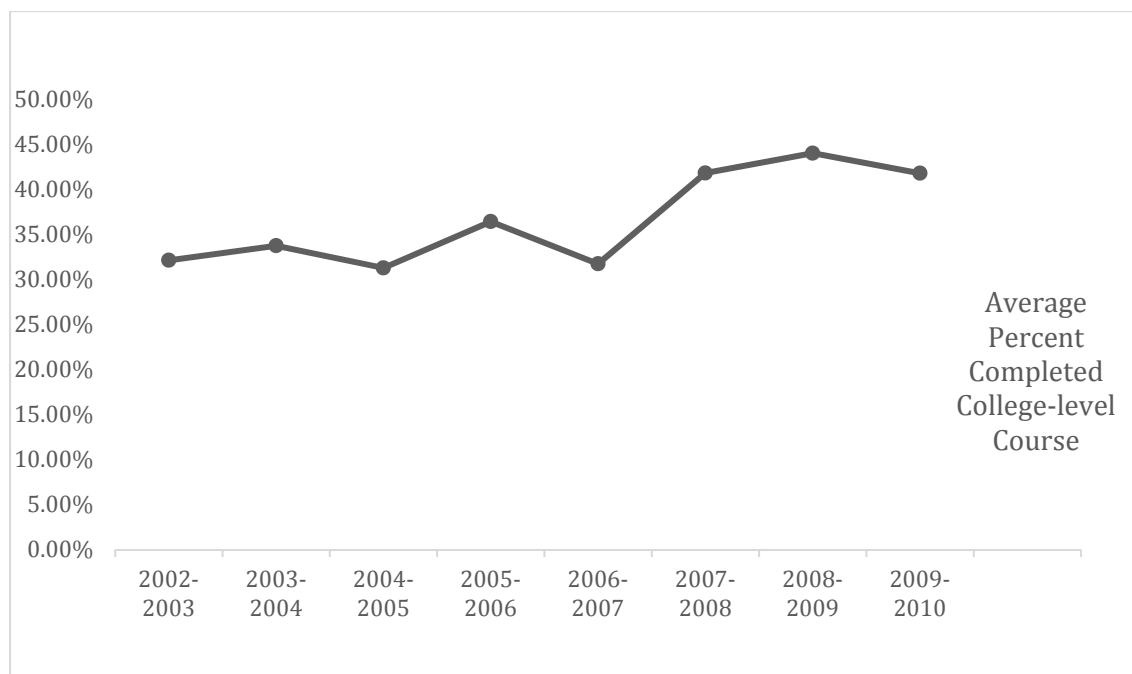


*Figure 3.1.* Average numbers of students who were enrolled in developmental education in mathematics at Texas 4-year universities for the 2002-2003 through the 2009-2010 academic years.





*Figure 3.2.* Average percent of students who were enrolled in developmental education in mathematics at Texas 4-year universities for the 2002-2003 through the 2009-2010 academic years.



*Figure 3.3.* Average percent of students who were enrolled in developmental education in mathematics and who completed a college-level course in mathematics at Texas 4-year universities for the 2002-2003 through the 2009-2010 academic years.

## CHAPTER IV

### DIFFERENCES IN DEVELOPMENTAL EDUCATION ENROLLMENT AND WRITING PERFORMANCE AT TEXAS 4-YEAR UNIVERSITIES: A MULTIYEAR, STATEWIDE STUDY

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This dissertation follows the style and format of *Research in the Schools (RITS)*.

### **Abstract**

In this research study, the numbers and percentages of students enrolled in developmental education in writing were determined for the 2002-2003 through the 2009-2010 academic years at Texas 4-year universities. Determined by this analysis was whether the numbers and percentages of students enrolled in developmental education in writing had changed over the 8 years of this study, as well as the degree to which students in developmental education in writing were able to complete a college-level course in writing. Revealed in this multiyear analysis were statistically significant differences in the percentages of students in developmental education in writing between the 2002-2003 and the 2009-2010 academic years. However, the average numbers of students enrolled in developmental education in writing had not changed over this 8 year time period. In the final year of this investigation, almost 40% of students in developmental education in writing did not complete a college-level course in writing. Implications for policymakers and recommendations for future research were provided.

**Keywords:** Developmental education, writing, Texas, 4-year universities, college-level course

DIFFERENCES IN DEVELOPMENTAL EDUCATION ENROLLMENT AND  
WRITING PERFORMANCE AT TEXAS 4-YEAR UNIVERSITIES: A MULTIYEAR,  
STATEWIDE STUDY

The college degree, once a part of the gold standard for American success, has come under fire in the last decade. Arum and Roksa (2011) claimed in their groundbreaking book, *Academically Adrift: Limited Learning on College Campuses*, only minimal learning was occurring in college. Rossi (2014) presented another example of criticism of higher education with the writing and directing of *Ivory Tower*, a controversial documentary in which the cost of a college degree in relationship to its value was questioned. Even William Bennett (2013), the former United States Secretary of Education, created doubt about a college degree's value with his book, *Is College Worth It?* Bennett (2013) opposed conventional beliefs about the necessity of college when so many college graduates were unemployed, underemployed, or saddled with staggering debt.

Despite these widely publicized criticisms, ample evidence exists that a college degree remains a valuable asset. Leonhardt (2014) reinforced what many Americans already believe: College degree holders earn more money than non-degreed individuals. According to Leonhardt (2014), Americans with a bachelor's degree earn 98% more per hour than those individuals without a 4-year degree, and that percentage has increased steadily each decade since the 1980s. Furthermore, the Pew Research Center (2014) identified additional support for earning a college degree for Millennials ages 25-32. For those Millennials with a 4-year degree, earnings averaged \$45,500 compared with \$28,000 for those individuals with only a high school diploma. The unemployment rate

was only 3.8% for Millennials with a 4-year degree compared with 12.2% for those young people with only a high school diploma. Ebersole (2012) refuted a common concern about a college degree's high cost, which averages \$64,000, and its overall value. A bachelor's degree is "repaid through the increased salary (\$1600 per month, or \$19,200 per year) in less than four years. Not a bad ROI [return on investment], and with a 50% increase in job security to boot" (Ebersole, 2012, p. 1). Harsh criticisms about a college degree's value might be prevalent, but its worth for graduates who desire steady employment and higher earnings cannot be denied.

### **College Readiness in Writing**

Although substantial evidence exists to support the importance of earning a college degree, many students do not meet readiness standards that will allow them to experience success in college. In fact, only 19 of every 100 students are ready for college-level course work (Royster, Gross, & Hochbein, 2015). According to the ACT (2013), 31% of students who took the ACT did not meet any of the college-readiness benchmarks for writing. This percentage is ironic given the fact that average GPAs have increased over the last 20 years as have the number of students enrolled in upper level high school courses (Hess, 2016). Regardless, college readiness remains a challenge for many students. To address the issue of poor college readiness skills, most states have adopted reforms, including the Common Core Standards, to work toward college readiness for all students and to indicate that a high school diploma actually signals preparedness for college-level courses (Gaertner & McClarty, 2015).

According to The Nation's Report Card (2011), a series of assessments given to students since 1969 to gauge student educational status and progress, only 24% of high

school seniors performed at the proficient level when given a computer-based writing test, indicating these students possessed clear communication skills in writing. Of note only 52% of high school seniors scored at the basic level, a level that indicates only partial mastery of writing skills. Black and Hispanic students scored lower than White and Asian students. Boys scored lower than girls, and students from families without college-educated parents scored lower than students whose parents did have college degrees. As such, The Nation's Report Card (2011) provided a revealing empirical analysis of the poor writing skills of high school students, along with identifying the presence of gaps in writing achievement.

Business leaders, too, are noticing lacking writing proficiency among today's workers, many of whom have college degrees. Moore (2016) reported that \$3.1 billion is spent by America's businesses to remediate writing among its employees. Employers noted that 26.2% of its college-educated workers had poor writing skills (Moore, 2016). Marginal writing proficiency seems to extend from the classroom to the work place, creating problems for workers who must produce quality emails, reports, and presentations to succeed.

Several researchers (Carter & Harper, 2013; Crank, 2012; Relles & Tierney, 2013) have investigated college readiness specifically as it pertains to writing. Carter and Harper (2013) investigated multiple reasons behind poor student writing, including grade inflation and reduced standards at the high school level. Although many college students believe their writing is satisfactory, SAT writing scores have shown a downward trend since the 1970s (Carter & Harper, 2013). Furthermore, Crank (2013) identified six themes common to both high school and college writing instruction. These themes may

inform educators about what students have learned in the past or will learn in the future about writing in hopes of improving college readiness (Crank, 2013). Interestingly, poor writing skills among incoming college students may be the result of lacking computer literacy in addition to writing struggles. Relles and Tierney (2013) examined struggling writers in relationship to their challenges with technology and determined that, “The data suggest a cautionary tale in which digital underpreparedness poses a hidden threat to students whose degree prospects are already severely reduced by underprepared composition skills” (p. 500).

An additional factor related to technology that may hinder college readiness in writing is the onslaught and popularity of social media. According to the Pew Research Center (2015), 90% of young adults ages 18-29 use social media. Lytle (2011) reported that many teachers struggle to assist students about correct writing practices in the face of social media, where abbreviating all words and ideas is favored. Even some younger teachers use shortened forms of written communication, and their standards for writing formality for their students may not be as stringent as that of older teachers (Lytle, 2011). Purcell, Buchanan, and Friedrich (2013) acknowledged that while some educators believe social media expanded writing creativity and opportunities, it also may influence student ability to discern between informal and formal writing, and social media may encourage students to see technology as a toy for entertainment and not a tool for serious writing and research. Therefore, the advantages of technology use for writing may be diminished by social media, which may influence college readiness in writing. As noted, many complex reasons exist for poor writing skills among incoming college students.



### **Persistence as a Function of Developmental Education**

Tinto, a widely recognized scholar and long-time researcher on the subject of college student persistence, advocated the importance of the classroom experience as the primary component to student success. Institutions “must direct their actions to the classroom, especially those in the first year, and construct classrooms whose attributes are such as to enhance the likelihood that students will succeed in the classroom” (Tinto, 2012, p. 4). Tinto (2012) suggested a combination of high expectations, academic support, frequent feedback, and classroom engagement is crucial to increase student persistence and to improve graduation rates.

Institutions attempt numerous strategies to improve the persistence of students who are most at risk of dropping out of college. According to the National Center for Education Statistics (2016), dropout rates for low-income and Black and Hispanic students have actually declined since 1990, but these groups of students still have the highest dropout rates when compared with middle and high-income students and White students. Enstrom and Tinto (2008) identified learning communities as one way to improve student persistence among low-income students. Students in learning communities claimed that attending classes in the same classroom with the same students and the same faculty allowed them to feel comfortable, encouraged, and supported. Persistence among students in learning-community groups was 10% higher at 4-year institutions when compared to students who were not in learning communities (Enstrom & Tinto, 2008).

Developmental education is another mechanism used by colleges to provide academic support for students and to improve persistence rates. The goal of

developmental education, oftentimes called remedial education, is to increase college readiness skills so underprepared students can proceed to college-level courses.

Regrettably, these courses are not yielding benefits for many students despite the best intentions of educators (Edgecombe, 2011). Bailey (2009) revealed that nearly one half of all students who are enrolled in developmental education do not complete the sequence of recommended courses, and many students who do complete the developmental course sequence do not proceed to college-level courses. The lacking effect of developmental education on persistence is troubling.

Clark, Slate, Moore, and Barnes (2015) concluded that developmental education did not positively influence White, Black, and Hispanic student persistence and graduation over a 3-year period. Students who did not enroll in developmental education had higher graduation rates than students who enrolled in developmental education. In most years of the study, White, Black, and Hispanic students who were not required to take developmental education courses had higher persistence rates than those students who were required to take developmental education courses. Equally concerning are the complex challenges associated with developmental education, ranging from discrepancies about the way to define college readiness, unclear and dubious test scores that place students in developmental education, and questions concerning the best way to offer remediation (Clark et al., 2015). Bailey (2009) addressed a common concern about developmental education: It “costs students, the colleges, and the public sector real resources, . . . [C]oncluding that developmental students do as well as similar students who go directly into college courses is not good enough and suggests that remediation wastes money and time” (p. 15).

## **Statement of the Problem**

In *Are They Really Ready to Work?* (Barrington & Casner-Lotto, 2006), a study produced by a consortium of human resource professionals that surveyed over 400 employers, workforce readiness was defined as workers who are “equipped with the basic knowledge and applied skills necessary to be competitive in the global economy of the 21st century” (p. 8). Employees’ written communications were a top priority among employers. Unfortunately, 80.9% of high school graduates, 47.3% of 2-year college graduates, and 27.8% of 4-year college graduates were rated as deficient in writing communications per this study and survey.

College students are expected to graduate with at least adequate writing skills, but many students enter college with poor writing skills, and they struggle to overcome those deficiencies during college. Students are enrolled in developmental education courses in college which are designed to remediate and improve basic skills like writing. However, most students are not benefitting from developmental courses (Bailey, Jeong, & Cho, 2010). Clark et al. (2015) suggested that “support services [need] to be evaluated to determine the extent to which they influence the persistence and graduation rates of students taking developmental education courses” (p. 97). An imperative exists to improve writing skills among college students as a function of developmental writing courses.

## **Purpose of the Study**

The purpose of this research study was to determine the numbers and percentages of students who were enrolled in developmental education in writing at Texas 4-year universities during the 2002-2003 through the 2009-2010 academic years. A second

purpose was to ascertain the degree to which the numbers and percentages of students who were enrolled in developmental education in writing changed from the 2002-2003 through the 2009-2010 academic years in Texas 4-year universities. A third purpose was to determine the extent to which student completion of a college-level course in writing changed between the 2003 and the 2010 academic years. The final purpose of this research study was to ascertain the degree to which a trend might be present both in the numbers and percentages of students who were enrolled in developmental education in writing, as well as in student completion of a college-level course in writing, during the 2002-2003 through the 2009-2010 academic years. Given the priorities assigned to retention and 4-year college-degree attainment, an imperative exists to ascertain the relationship between developmental course enrollment in writing and student success.

### **Significance of the Study**

Several researchers (Carter & Harper, 2013; Crank, 2012; Crews & Aragon, 2007; Relles & Tierney, 2013) have already examined methods to assist unprepared college writers through remediation and developmental education courses in writing in hopes to improve student success in college-level courses. For this study, the phrase, success rates, was used to refer to completion of a college-level course in writing. Few researchers, to date, have focused their efforts on the relationship between developmental courses in writing and the completion of college-level writing courses at Texas 4-year universities over a certain period. Furthermore, an analysis of the relationship between developmental course enrollment in writing and success rates at Texas 4-year universities over time has not occurred to date. By examining the differences in the performance of students who enroll in a developmental writing course and their subsequent completion of

a college-level writing course, a trend can be revealed. The findings of this study may assist educators in higher education and in K-12 settings to improve student proficiency in writing. By determining the relationship between developmental course enrollment in writing and success rates, a variety of meaningful interventions could assist students. Students whose writing skills are lacking could then benefit from developmental courses designed to assist struggling writers.

### **Research Questions**

The research questions addressed in this empirical investigation were: (a) What are the numbers of students who were enrolled in developmental education in writing at Texas 4-year universities for the 2002-2003 through the 2009-2010 academic years?; (b) What are the percentages of students who were enrolled in developmental education in writing at Texas 4-year universities for the 2002-2003 through the 2009-2010 academic years?; (c) What is the difference in the average number of students who were enrolled in developmental education writing at Texas 4-year universities between the 2002-2003 and 2009-2010 academic years?; (d) What is the difference in the average percent of students who were enrolled in developmental education writing at Texas 4-year universities between the 2002-2003 and 2009-2010 academic years?; (e) What are the percentages of students who were enrolled in developmental education in writing and who completed a college-level course in writing in the 2002-2003 through the 2009-2010 academic years?; (f) What is the difference in the percentage of students who were enrolled in developmental education writing at Texas 4-year universities and who completed a college-level course in writing between the 2002-2003 and 2009-2010 academic years?; (g) What trend is present, if any, in the numbers of students who were enrolled in

developmental education in writing at Texas 4-year universities from the 2002-2003 through the 2009-2010 academic years?; (h) What trend is present, if any, in the percentages of students who were enrolled in developmental education in writing at Texas 4-year universities from the 2002-2003 through the 2009-2010 academic years?; and (i) What trend is present, if any, in the percentages of students who were enrolled in developmental education in writing and who completed a college-level course in writing at Texas 4-year universities from the 2002-2003 through the 2009-2010 academic years?

## **Method**

### **Research Design**

For this study, a longitudinal, explanatory investigation constituted the research design used (Johnson, 2001). Archival data were used to answer the research questions previously discussed. Both the independent variables and the dependent variables to be used in this investigation had already occurred and extraneous variables were not controlled in this study design (Johnson & Christensen, 2012). The independent variable was the specific academic year in which data on developmental education in writing were available. The dependent variables were (a) the number of students who were enrolled in developmental education writing in each of the academic years, (b) the percentage of students enrolled in developmental education writing out of the total student enrollment, and (c) the percentages of students who completed a college-level course in writing.

### **Participants and Instrumentation**

Archival data were obtained from the 2002-2003 through the 2009-2010 academic years from the Texas Higher Education Coordinating Board Interactive Accountability System (2016) for all students at Texas 4-year universities who first enrolled in a

developmental education course and then enrolled in a college-level course in writing. Success rates and trends of 4-year universities from the 2002-2003 through the 2009-2010 academic years were determined. All available data were analyzed; data were not available for some universities.

Data for this study were downloaded from the Texas Higher Education Coordinating Board Accountability System, the Texas Higher Education Coordinating Board Developmental Education Accountability Measures Data website. The Texas Higher Education Coordinating Board Interactive Accountability System (2016) is used to track performance of Texas universities on issues considered essential to the success of higher education. For this study, data specifically regarding developmental education courses in writing of students enrolled in 4-year Texas universities were analyzed. Developmental education is defined by the Texas Higher Education Coordinating Board as “courses, tutorials, laboratories, or other efforts to bring students’ skill levels in reading, writing, and mathematics to entering college level” (2012, p. 25). For this study, only college-level courses completed with a grade of A, B, or C were examined according to the data provided by the Texas Higher Education Coordinating Board Interactive Accountability System (2016). Inferential statistical procedures were used to determine whether trends existed from the 2002-2003 through the 2009-2010 academic years regarding developmental course completion and subsequent college-level course completion.

## **Results**

Regarding the first research question, descriptive statistics were calculated for the numbers of students who were enrolled in developmental education in writing at Texas 4-

year universities for the 2002-2003 academic year through the 2009-2010 academic year. The first year of the study, 2002-2003, and the final year of the study, 2009-2010, had nearly the same number of students enrolled, 4,927 and 4,940, respectively. Of particular note to readers was the 2006-2007 academic year had the fewest students ( $n = 2,629$ ) who were enrolled in developmental education in writing, more than 50% less than the highest number of students ( $n = 4,940$ ) who were enrolled in the final year of this study. Readers are directed to Table 4.1 for these descriptive statistics for the numbers of students who were enrolled in developmental education in writing in Texas 4-year universities from the 2002-2003 through the 2009-2010 academic year.

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 Insert Table 4.1 about here  
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Regarding the second research question, data available on the Texas Higher Education Coordinating Board Interactive Accountability System were not the percentages of students who were enrolled in developmental education in writing. The data that were available and that were analyzed herein were the percentages of students who were not enrolled in developmental education in writing. Because the focus of the second research question was the percentages of students who were enrolled in developmental education in writing, average percentages were subtracted from 100% in each academic year. Produced were the calculations for the percentages of students who were enrolled in developmental education in writing. Reflected in Table 4.2 are the descriptive statistics for the percentages of students who were enrolled in developmental education in writing.



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Insert Table 4.2 about here  
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In the 2004-2005 academic year, the highest average percentage of students ( $M = 47.84\%$ ) were enrolled in developmental education in writing. The highest percentage of students ( $M = 40.00\%$ ) who were enrolled in developmental education in writing was in the first year of the study, the 2002-2003 academic year. Readers should note that the lowest percentage of students enrolled occurred in the 2007-2008 academic year. This percentage of students was more than 50% lower than in the first year of the study.

Regarding research question three, inferential statistics were conducted to determine whether differences were present in the average number of students who were enrolled in developmental education in writing between the 2002-2003 academic year and the 2009-2010 academic year at Texas 4-year universities. Checks were conducted to determine the extent to which these data were normally distributed (Onwuegbuzie & Daniel, 2002). Even though some of the values were reflective of non-normal data, a parametric dependent samples  $t$ -test was used to answer the third research question. A statistically significant difference was not present in the average number of students who were enrolled in developmental education in writing,  $t(30) = 0.00$ ,  $p = 1.00$ , between the 2002-2003 and 2009-2010 academic year. In both academic years, the average numbers of students enrolled in developmental education in writing were very similar, reflecting no changes from the first year of the study to the final year of the study. Readers are directed to Table 4.3 for the descriptive statistics for this analysis.

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Insert Table 4.3 about here  
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To answer the fourth research question, a parametric dependent samples *t*-test was used. A statistically significant difference was yielded in the average percent of students who were enrolled in developmental education in writing,  $t(29) = -4.17$ ,  $p = .001$  between the 2002-2003 academic year and the 2009-2010 academic year at Texas 4-year universities. This difference represented a large effect size (Cohen's *d*) of 0.84 (Cohen, 1988). In the 2009-2010 academic year, the final year of the study, more than a 15% increase was present in the percentage of students enrolled in developmental education in writing when compared to the first year of the study, the 2002-2003 academic year.

Delineated in Table 4.4 are the descriptive statistics for this analysis.

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Insert Table 4.4 about here  
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Regarding the fifth research question, descriptive statistics were calculated for the percentages of students who were enrolled in developmental education in writing and who completed a college-level course in writing at Texas 4-year universities for the 2002-2003 academic year through the 2009-2010 academic year. The final three years of this investigation revealed the highest percentages of students who completed a college-level course in writing. However, readers should note a relatively limited improvement in the percentages of developmental education students who completed a college-level

writing course from the first year of the study to the final year of the study, only a 6% increase. Readers are directed to Table 4.5 for these descriptive statistics.

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 Insert Table 4.5 about here  
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To answer the sixth research question, checks were conducted to determine the extent to which these data were normally distributed (Onwuegbuzie & Daniel, 2002). Although some values were indicative of non-normally distributed data, a parametric dependent samples *t*-test was used. A statistically significant difference was revealed in the percentage of students who were enrolled in developmental education in writing and who completed a college-level course in writing,  $t(29) = -3.07, p = .005$ , between the 2002-2003 academic year and the 2009-2010 academic year at Texas 4-year universities. This difference represented a moderate effect size (Cohen's *d*) of 0.74 (Cohen, 1988). A statistically significantly higher percentage of students, an increase of 13%, were enrolled in developmental education in writing and completed a college-level course in writing in the 2009-2010 academic year than in the 2002-2003 academic year. Reflected in Table 4.6 are the descriptive statistics for this analysis.

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 Insert Table 4.6 about here  
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To answer research questions seven, eight, and nine, figures were generated to determine the degree to which trends were present. With respect to research question seven, as revealed in Figure 4.1, was that average numbers of students who were enrolled

in developmental education in writing decreased from the 2002-2003 academic year to the 2006-2007 academic year. However, in the last three years of the study, the average numbers of students who were enrolled in developmental education in writing increased. The numbers of students enrolled in developmental education in writing were nearly the same for the last two years of the study.

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 Insert Figure 4.1 about here  
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Depicted in Figure 4.2 is that the percentages of students who were enrolled in developmental education in writing decreased for first six years of the study. The percentages of students who were enrolled in developmental education in writing then increased in the 2008-2009 academic year. A slight decrease was observed in the percentages of students who were enrolled in developmental education in writing in the final year of the study, the 2009-2010 academic year.

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 Insert Figure 4.2 about here  
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Shown in Figure 4.3 are the average percentages of students for the 2002-2003 academic year through the 2006-2007 academic year. The percentages of developmental students who completed a college-level course in writing increased by more than 10% in the 2007-2008 academic year. However, in the final two years of the study, the 2008-2009 and 2009-2010 academic years, the percentages of students who completed a college-level course in writing decreased.

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 Insert Figure 4.3 about here  
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### **Discussion**

In this multiyear, statewide analysis, data were examined on students who were enrolled in developmental education in writing at Texas 4-year universities in the 2002-2003 through the 2009-2010 academic years. The Texas Higher Education Coordinating Board Interactive Accountability System data were analyzed over an 8-year period. From the 2002-2003 through the 2009-2010 academic years, at least 30 Texas 4-year universities provided data that were analyzed.

Regarding the eight years of data analyzed, statistically significant differences were not present in the numbers of students who were enrolled in developmental education in writing. In this investigation, the average number of students enrolled in developmental education in writing was nearly the same at the beginning of the study ( $n = 4,927$ ) and at the completion of the study ( $n = 4,940$ ). However, for both the percentages of students enrolled and the students who then completed a college-level course in writing, statistically significant differences were present. The lowest average percentage of students enrolled in developmental education in writing was 18% in the 2007-2008 academic year. The highest average percentage was 40% in the 2002-2003 academic year, the first year of the study. The average percentage of students in developmental education who completed a college-level course in writing was the lowest, 48%, in the first year of the study (i.e., 2002-2003), and was the highest, 65%, in the 2007-2008 academic year.

### **Connections with Existing Literature**

Previous researchers (Crews & Aragon, 2007; Saxon, Slate, & Barnes, 2015) have analyzed data on students who were enrolled in developmental education in writing. In this 8-year investigation, the percentages of students enrolled in developmental education in writing at Texas 4-year universities decreased over time. Results of this study were not congruent with Saxon et al. (2015) wherein percentages of students enrolled in developmental education in writing at community colleges in Texas were higher. According to Saxon et al. (2015), nearly 60% of students were enrolled in developmental education in writing in the 2002-2003 academic year. This percentage is 20% higher than the percentage of students who were enrolled in developmental education in writing at Texas 4-year universities during that same academic year. This difference might indicate that 4-year university students are better prepared for the challenges of college writing than their counterparts at community college.

Crews and Aragon (2007) determined that community college students enrolled in a developmental course in writing did not persist through college courses any better than students who did not complete developmental writing courses. Completing these courses had no effect on student completion of a certificate or a degree as well. Crews and Aragon (2007) identified some positive effects on student achievement after students completed developmental courses in writing; however, the gains were minimal. Crews and Aragon's (2007) results differed somewhat from this study, which indicated a 10% improvement in the percentages of students who completed a college-level course in writing from the 2002-2003 academic year to the final year of the study. Nearly 60% of developmental education students completed a college-level course in writing in the

2009-2010 academic year. Because the focus of this study was on Texas 4-year university students rather than on community college students, this difference in postsecondary settings might have led to disparate results.

### **Implication for Policy and Practice**

In this analysis, the numbers of students enrolled in developmental education in writing at Texas 4-year universities remained nearly the same from the 2002-2003 academic year to the 2009-2010 academic year. Unfortunately, these similar numbers indicate that minimal improvements have transpired in preparing students for college writing. Because nearly 40% of students who enrolled in a developmental education course did not complete a college-level course in writing in the final year of the study, Texas 4-year universities must provide improved remediation for students who struggle with college writing.

Saxon et al. (2015) suggested that too many variables were used to determine the college readiness of Texas college students, which shortchanged students who needed developmental education. With new Texas Success Initiative guidelines implemented in 2003, institutions were able to set their own standards for developmental education status. Too many underprepared students were allowed to exempt developmental courses (Saxon et al., 2015). Policymakers should reevaluate the standards by which students are placed into developmental education, and they should consider the validity of the variety of exemptions provided to students. Crews and Aragon (2007) emphasized that institutions should focus more specifically on their responsibilities for student success. Higher education administrators must prioritize developmental education students by creating effective courses taught by instructors who have specific training in helping

underprepared students. For many students, developmental education is their only opportunity for success in college (Crews & Aragon, 2007).

### **Recommendations for Future Research**

Examined in this 8-year, statewide investigation were the numbers and percentages of developmental education students in writing at Texas 4-year universities. However, this study could be extended to developmental education students in reading to determine whether similarities or differences among results reported in this study differed. The study could also be extended to developmental education in mathematics. The extent to which results from this study on students in developmental education in writing might generalize to students in developmental education in reading or in mathematics is not known. This study could also be replicated in other states to ascertain the extent to which findings delineated herein are generalizable to other states. Comparing these results to community colleges in both Texas and in other states is another suggestion for future research. Would results from community colleges present differences or similarities when compared to results of this study?

Not considered in this investigation were student demographic characteristics in relationship to student enrollment and student success in developmental education. Studies in which student demographic characteristics such as ethnicity/race, gender, first time in college status, and first generation student are examined with respect to developmental education are encouraged. Researchers are also encouraged to investigate different types of methods of providing developmental education, such as condensed courses, and whether these variations affect student success.



## **Conclusion**

The extent to which differences were present in the numbers and percentages of students enrolled in developmental education in writing at Texas 4-year universities from the 2002-2003 academic year through the 2009-2010 academic year was the focus of this research study. The numbers of students enrolled in developmental education in writing were nearly the same from the first year of the study to the final year of the study. Percentages of students enrolled in developmental education in writing decreased over time. Students who were enrolled in developmental education in writing and who completed a college-level course in writing increased slightly more than 10% during the eight years of the study. Because the numbers of students enrolled did not change, and 40% of students did not complete a college-level course, much potential for improvement exists.

Saxon et al. (2015) suggested that Texas policymakers reconsider the wide range of exemptions that allow unprepared students to bypass developmental education. Many students will not succeed in college without remediation. With nearly 70% of students failing to meet the ACT's (2013) college readiness standards in writing, lacking proficiency in writing is an educational crisis. Universities must improve the quality of developmental education courses, and they must ensure that each student who needs developmental education actually receives it.

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Table 4.1

*Descriptive Statistics for the Number of Students Below State Standards in Writing at Texas 4-year Universities From the 2002-2003 Through the 2009-2010 Academic Year*

Academic Year	<i>n</i> of 4-year universities	<i>M</i>	<i>SD</i>	Sum
2002-2003	31	158.94	215.12	4,927
2003-2004	32	149.50	178.95	4,784
2004-2005	31	132.10	134.53	4,095
2005-2006	31	114.94	116.25	3,563
2006-2007	32	82.17	87.18	2,629
2007-2008	32	96.56	101.64	3,090
2008-2009	34	137.44	158.06	4,673
2009-2010	36	137.22	167.29	4,940

Table 4.2

*Descriptive Statistics for the Percent of Developmental Education Students Who Met the TSI Obligation in Writing at Texas 4-year Universities From the 2002-2003 Through the 2009-2010 Academic Year*

Academic Year	<i>n</i> of 4-year universities	<i>M</i> %	<i>SD</i> %
2002-2003	31	40.00	20.00
2003-2004	30	38.88	19.33
2004-2005	30	33.88	19.22
2005-2006	31	27.19	13.76
2006-2007	31	24.27	15.14
2007-2008	31	18.06	16.03
2008-2009	32	29.62	19.83
2009-2010	33	27.17	17.94

Table 4.3

*Descriptive Statistics for the Average Number of Students Who Were Enrolled in Developmental Education in Writing in the 2002-2003 and the 2009-2010 Academic Year at Texas 4-year Universities*

Academic Year	<i>n</i> of 4-year universities	<i>M</i>	<i>SD</i>
2002-2003	31	158.94	215.12
2009-2010	31	158.94	170.71



Table 4.4

*Descriptive Statistics for the Average Percent of Students Who Were Enrolled in Developmental Education in Writing in the 2002-2003 and the 2009-2010 Academic Year at Texas 4-year Universities*

Academic Year	<i>n</i> of 4-year universities	<i>M%</i>	<i>SD%</i>
2002-2003	30	59.01	19.67
2009-2010	30	74.55	17.19

Table 4.5

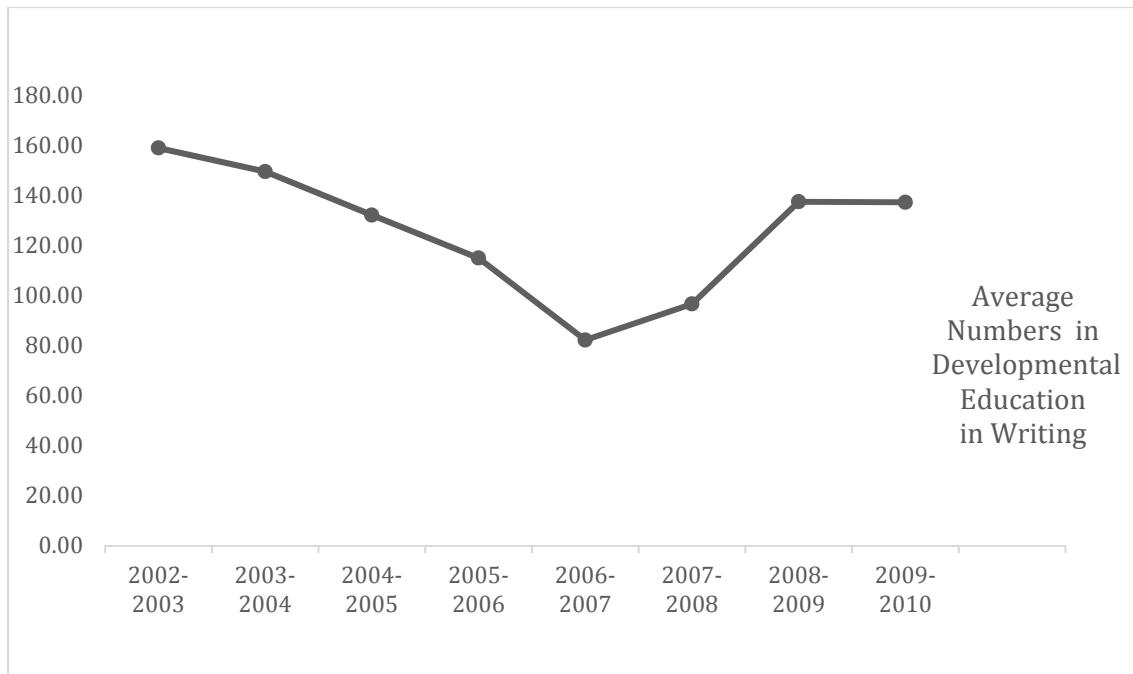
*Descriptive Statistics for the Percent of Developmental Education Students Who Earned a Grade of A, B, or C in a College-level Course in Writing at Texas 4-year Universities From the 2002-2003 Through the 2009-2010 Academic Year*

Academic Year	<i>n</i> of 4-year universities	<i>M</i> %	<i>SD</i> %
2002-2003	31	48.19	17.05
2003-2004	30	52.92	18.64
2004-2005	30	54.01	17.18
2005-2006	31	52.00	19.53
2006-2007	31	49.96	17.00
2007-2008	31	64.74	20.20
2008-2009	32	59.20	21.15
2009-2010	34	59.44	17.14

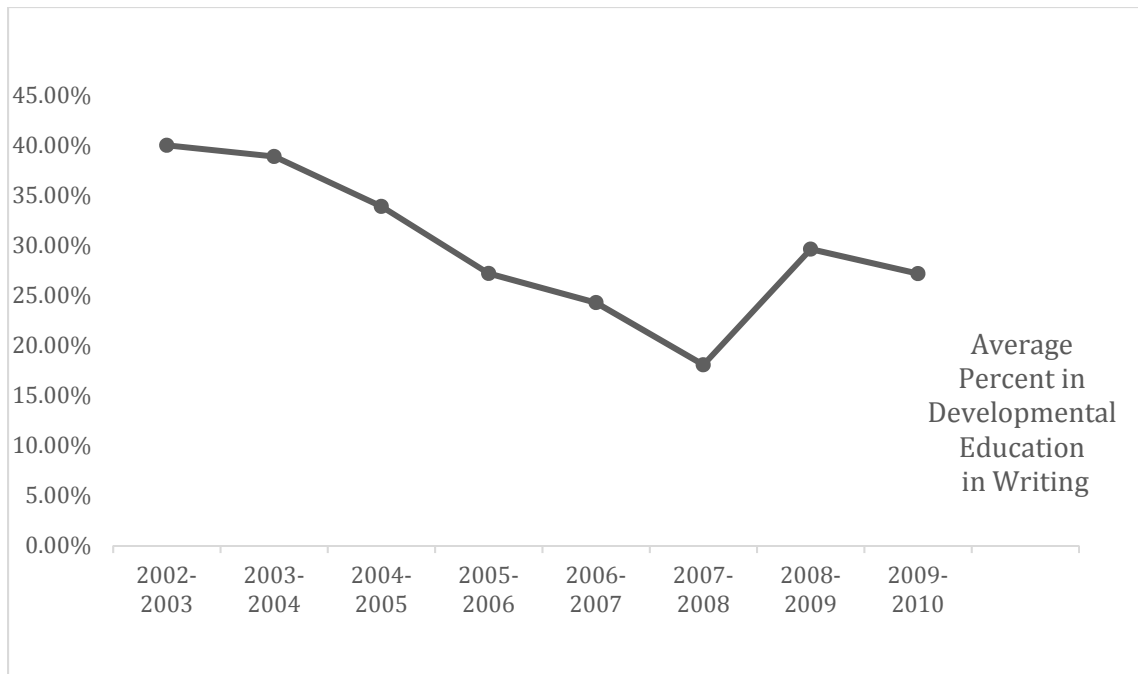
Table 4.6

*Descriptive Statistics for the Percent of Students Enrolled in Developmental Education in Writing at Texas 4-year Universities and Who Completed a College-level Course in Writing in the 2002-2003 and 2009-2010 Academic Year*

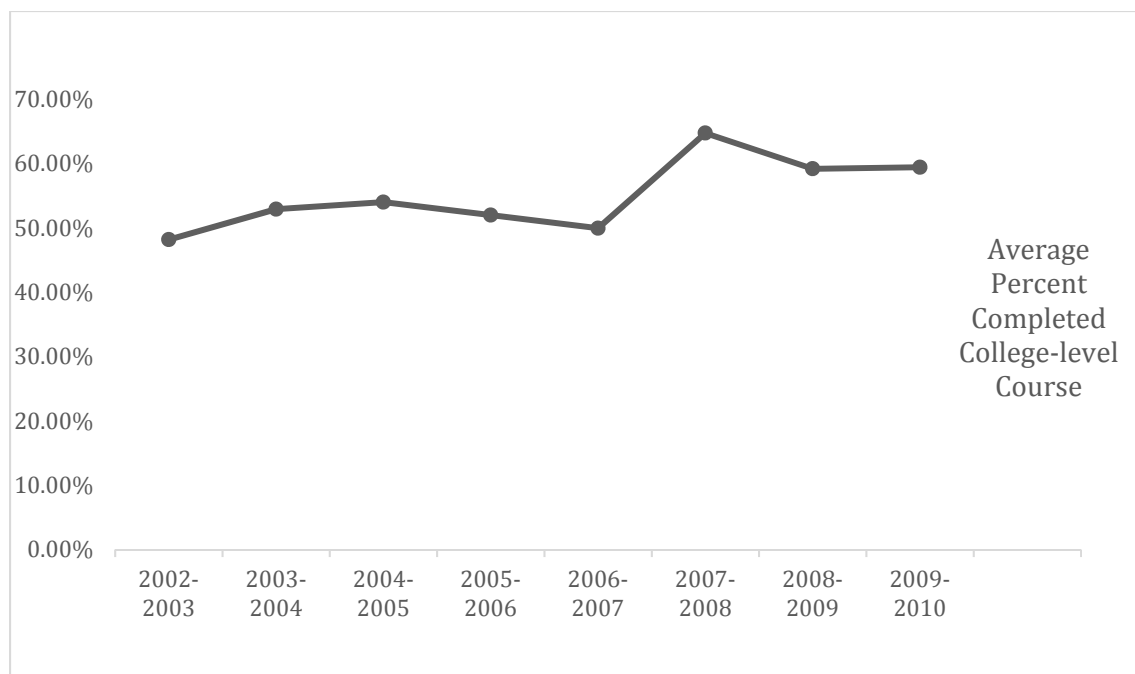
Academic Year	<i>n</i> of 4-year universities	<i>M%</i>	<i>SD%</i>
2002-2003	30	47.71	17.13
2009-2010	30	59.62	15.21



*Figure 4.1.* Average numbers of students who were enrolled in developmental education in writing at Texas 4-year universities for the 2002-2003 through the 2009-2010 academic years.



*Figure 4.2.* Average percent of students who were enrolled in developmental education in writing at Texas 4-year universities for the 2002-2003 through the 2009-2010 academic years.



*Figure 4.3.* Average percent of students who were enrolled in developmental education in writing and who completed a college-level course in writing at Texas 4-year universities for the 2002-2003 through the 2009-2010 academic years.

## **CHAPTER V**

### **DISCUSSION**

The purpose of this journal-ready dissertation was to determine the numbers and percentages of students who were enrolled in developmental education in reading, mathematics, and writing at Texas 4-year universities during the 2002-2003 through the 2009-2010 academic years. A second purpose was to ascertain the degree to which the numbers and percentages of students who were enrolled in developmental education in reading, mathematics, and writing changed from the 2002-2003 through the 2009-2010 academic years in Texas 4-year universities. A third purpose was to determine the extent to which student completion of a college-level course in reading, mathematics, and writing changed between the 2003 and the 2010 academic years. The final purpose of this journal-ready dissertation was to ascertain the degree to which a trend might be present both in the numbers and percentages of students who were enrolled in developmental education in reading, mathematics, and writing, as well as in student completion of a college-level course in reading, mathematics, and writing, during the 2002-2003 through the 2009-2010 academic years. Given the emphases placed on retention and 4-year college-degree attainment, an imperative exists to ascertain the relationship between developmental course enrollment and student success.

In the first journal article, the numbers and percentages of students enrolled in developmental education in reading at Texas 4-year universities for the 2002-2003 through the 2009-2010 academic years were analyzed. In the second study, the numbers and percentages of students enrolled in developmental education in mathematics at Texas 4-year universities for the 2002-2003 through the 2009-2010 academic years were

analyzed. Finally, in the third investigation, the numbers and percentages of students enrolled in developmental education in writing at Texas 4-year universities for the 2002-2003 through the 2009-2010 academic years were examined. In this chapter, each article's results are summarized. This chapter also includes implications for policy and practice and recommendations for future research.

### **Study One Results**

In the first investigation, the numbers and percentages of students enrolled in developmental education in reading at Texas 4-year universities for the 2002-2003 through the 2009-2010 academic years were examined, along with the percentages of students enrolled in developmental education in reading who then completed a college-level course in reading. The extent to which trends were present across this time frame was also addressed. Eight years of archival data from the Texas Higher Education Coordinating Board were obtained and analyzed for the 2002-2003 through the 2009-2010 academic years. Statistically significant differences were present for the numbers and percentages over the eight years of the study. Both the numbers and the percentages of students who were enrolled in developmental education in reading decreased over time. The percentage of students enrolled in developmental education in reading and who completed a college-level course in reading increased by 12 percentage points from the first year of the study to the final year of the study. Table 5.1 contains a summary of the results of the numbers and the percentages of students enrolled in developmental education in reading.



Table 5.1

*Summary of Results for Students Enrolled in Developmental Education in Reading at Texas 4-year Universities*

Dependent Variable	Statistically Significant	Cohen's <i>d</i>	Effect Size Range
Numbers Enrolled	Yes	0.24	Small
Percentages Enrolled	Yes	0.43	Small
Complete College-level Course	Yes	0.72	Moderate

### **Study Two Results**

In the second journal-ready article, the numbers and percentages of students who were enrolled in developmental education in mathematics as well as those students who completed a college-level course in mathematics at Texas 4-year universities for the 2002-2003 through the 2009-2010 academic years were examined. Eight years of archival data from the Texas Higher Education Coordinating Board were obtained and analyzed for the 2002-2003 through the 2009-2010 academic years. Statistically significant differences were present for the numbers of students enrolled in developmental education in mathematics and for the percentage of students who then completed a college-level course in mathematics, but not in the percentages of students enrolled in developmental education in mathematics. Students who completed a college-level course in mathematics increased by nearly 10 percentage points during the final year of the study when compared to the first year of the study. Table 5.2 contains a summary of the results of the numbers and the percentages of students enrolled in developmental education in mathematics.

Table 5.2

*Summary of Results for Students Enrolled in Developmental Education in Mathematics at Texas 4-year Universities*

Dependent Variable	Statistically Significant	Cohen's <i>d</i>	Effect Size Range
Numbers Enrolled	Yes	0.31	Small
Percentages Enrolled	No	N/A	N/A
Complete College-level Course	Yes	0.60	Moderate

### **Study Three Results**

In the third study, the numbers and percentages of students enrolled in developmental education in writing at Texas 4-year universities for the 2002-2003 through the 2009-2010 academic years were examined. Also, the percentages of students enrolled in developmental education in writing who then completed a college-level course in writing were analyzed. Trends were examined to determine whether differences occurred from the first academic year of the study to the final academic year of the study. Eight years of archival data from the Texas Higher Education Coordinating Board were obtained and analyzed for the 2002-2003 through the 2009-2010 academic years. Statistically significant differences were present for the percentages of students enrolled in developmental education in writing and for the percentages of students who then completed a college-level course in writing, but not for the numbers of students enrolled in developmental education in writing. The percentage of students enrolled in developmental education in writing and who completed a college-level course in writing increased by 12 percentage points from the first year of the study to the final year of the

study. Table 5.3 contains a summary of the results of the numbers and percentages of students enrolled in developmental education in writing.

Table 5.3

*Summary of Results for Students Enrolled in Developmental Education in Writing at Texas 4-year Universities*

Dependent Variable	Statistically Significant	Cohen's <i>d</i>	Effect Size Range
Numbers Enrolled	No	N/A	N/A
Percentages Enrolled	Yes	0.84	Large
Complete College-level Course	Yes	0.74	Moderate

### **Summary of Results**

In the three investigations conducted in this journal-ready dissertation, statistically significant results were present in all of analyses in the first article; in two of the three analyses in the second article; and in two of the three analyses in the third article. With respect to the numbers and percentages of students enrolled in developmental education in reading, the numbers and percentages of students enrolled decreased. The percentages of students who then completed a college-level course in reading increased. The numbers of students enrolled in developmental education in reading were the highest in the 2003-2004 academic year at 7,206 and were the lowest in the 2006-2007 academic year at 4,381. For the percentages of students enrolled in developmental education in reading, the highest percentage was in the 2003-2004 academic year at 34% and lowest in the 2007-2008 academic year at 16%. Regarding the percentage of students enrolled in developmental education in reading and who completed a college-level course in reading,

the highest percentage was in the 2007-2008 academic year at 71% and the lowest percentage was in the 2002-2003, 2003-2004, and 2006-2007 academic years at 55%.

Regarding the numbers and percentages of students enrolled in developmental education in mathematics, the numbers and percentages of students enrolled decreased. However, the decrease in the percentage of students enrolled in developmental education in mathematics was not statistically significant. The percentages of students who then completed a college-level course in mathematics increased. The numbers of students enrolled were highest in the 2003-2004 academic year at 9,340 and were lowest in the 2006-2007 academic year at 5,912. For the percentages of students enrolled in developmental education in mathematics, the highest percentage was in the 2004-2005 academic year at 48% and lowest in the 2007-2008 academic year at 32%. Regarding the percentage of students enrolled in developmental education in mathematics and who completed a college-level course in mathematics, the highest percentage was in the 2008-2009 academic year at 44% and the lowest percentage was in the 2004-2005 academic year at 31%.

With respect to the numbers of students enrolled in developmental education in writing, the numbers were not statistically significant over time. The percentages of students enrolled in developmental education in writing decreased. The percentages of students who then completed a college-level course in writing increased. The numbers of students enrolled were highest in the 2009-2010 academic year at 4,940 and were lowest in the 2006-2007 academic year at 2,629. For the percentages of students enrolled in developmental education in writing, the highest percentage was in the 2002-2003 academic year at 40% and lowest in the 2007-2008 academic year at 18%. Regarding the

percentage of students enrolled in developmental education in writing and who completed a college-level course in writing, the highest percentage was in the 2007-2008 academic year at 65% and the lowest percentage was in the 2002-2003 academic year at 48%.

### **Implications for Policy and Practice**

In the three investigations in this journal-ready dissertation, the numbers of students enrolled in developmental education decreased in both reading and mathematics, but not in writing. The percentages of students enrolled in developmental education, however, did decrease in all three areas. Increases were documented in the percentages of students who completed a college-level course in reading, mathematics, and writing. Despite fewer students enrolling in developmental education courses at 4-year universities in Texas from the first year of this study to the final year of this study, many students remain in need of remediation. Although many students who enroll in developmental courses progress to college-level course completion, many students do not achieve these successes. In the final academic year of this study, 33% of students in reading, 40% of students in mathematics, and 40% of students in writing did not complete a college-level course in those subjects after enrolling in developmental education courses. The findings from these studies have important implications for policy and practice at universities.

First, an evaluation of exemptions allowed by students to avoid developmental education must be reconsidered. Decreasing numbers and percentages of students enrolled in developmental courses at Texas 4-year universities might indicate that more students are ready for college-level courses. However, considering that the ACT (2013)

reported that only 25% of students were college ready in the four academic subjects of reading, mathematics, writing, and science, this indication is not likely to be the case. Another more likely scenario might be that students who need developmental education are bypassing those courses due to varied exemptions at universities. Taking a dual enrollment course or passing the state exit-level examination does not always guarantee college readiness, but these are common ways that students exempt developmental education (Saxon et al., 2015). Fewer, more stringent exemptions should be in place to assure that students who lack college-readiness skills are receiving the remediation they need through developmental education.

More attention is needed on the efficacy of developmental education. Most students who enroll in developmental education do not persist through college and graduate (Bailey, Jeong, & Cho, 2010). To combat the limited effectiveness of developmental education courses, universities must prioritize how to improve its capabilities so that more students can complete college-level courses. Exploring new options for delivery of developmental courses might be more successful (Levin & Calcagno, 2007; Sheldon & Durdella, 2010). Instructors who teach developmental education courses must be trained to work specifically with students requiring remediation. Developmental education can be more effective, but more focus on its methods is needed.

Finally, increased collaboration between higher education and secondary education professionals must exist. With only 54% of graduating high school seniors achieving college readiness in reading in Texas in 2009 (Barnes & Slate, 2013), and only 58% of college students achieving college readiness in mathematics in 2008 in Texas

(Abraham, Slate, Saxon, & Barnes, 2014), much opportunity exists for educators to work together to improve academic preparedness. However, much blame circulates among various education entities about lacking college readiness. Recently, the Texas Higher Education Commissioner and the State Board of Education were at odds. University representatives placed culpability on public schools for not doing enough to prepare students for college, whereas public school officials claimed that K-12 teachers were not adequately prepared by universities to meet the academic needs of students (Collier, 2016). Improved college readiness will not occur if all educators are not working together more closely to set and accomplish standards for academic success in college.

### **Recommendations for Future Research**

Many opportunities for future research exist based on the results of the three investigations conducted in this journal-ready dissertation. Texas 4-year universities were the focus of the studies in this journal-ready dissertation. As such, researchers should extend the study to 4-year universities in other states. It is unknown whether the results delineated herein are generalizable to students in developmental education in other states. Extending these investigations to community colleges would be another suggestion for future research. Would results obtained from community colleges be different when compared to the results of these studies? Researchers are also encouraged to extend these studies to community colleges in other states.

Not considered in this investigation were student demographic characteristics and their relationships to student enrollment and student success in developmental education. Researchers are encouraged to examine the extent to which ethnicity/race and gender were related to developmental education student performance. Also recommended would

be extending these studies to different types of developmental education courses, such as compressed or concurrent courses. Researchers are encouraged to investigate the extent to which various methods of delivery is related to student performance.

### **Conclusion**

The purpose of this journal-ready dissertation was to examine the numbers and percentages of students enrolled in developmental education in reading, mathematics, and writing. Additionally analyzed were the percentages of students who enrolled in developmental education and then completed a college-level course in reading, mathematics, and writing. Statistically significant differences were present for the numbers of students enrolled in reading and mathematics and for the the percentages of students enrolled in reading and writing. For college-level course completion in reading, mathematics, and writing, statistically significant differences were present for all three subjects. Statistically significant differences were not present for the numbers of students enrolled in developmental education in writing and for the percentage of students enrolled in developmental education in mathematics. Although decreases were observed in the numbers and percentages of students enrolled in developmental education courses, at least one-third of students enrolled in developmental education failed to complete a college-level course in reading, mathematics, or writing.



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obligations, and discrimination in an ethnically diverse sample. *Applied*

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## Appendix



**Institutional Review Board**  
**Office of Research and Sponsored Programs**  
 903 Bowers Blvd, Huntsville, TX 77341-2448  
 Phone: 936.294.4875  
 Fax: 936.294.3622  
[irb@shsu.edu](mailto:irb@shsu.edu)  
[www.shsu.edu/~rgs\\_www/irb/](http://www.shsu.edu/~rgs_www/irb/)

DATE: December 6, 2016

TO: Kimberly Priesmeyer [Faculty Sponsor: Dr. John Slate]

FROM: Sam Houston State University (SHSU) IRB

PROJECT TITLE: *Difference in Developmental Education Enrollment and Performance at Texas 4-Year Universities: A Multiyear, Statewide Study [T/D]*

PROTOCOL #: 2016-11-32863

SUBMISSION TYPE: INITIAL REVIEW

ACTION: DETERMINATION OF EXEMPT STATUS

DECISION DATE: December 6, 2016

REVIEW CATEGORY: Category 4—research involving existing, publicly available data usually has little, if any, associated risk, particularly if subject identifiers are removed from the data or specimens.

Thank you for your submission of Initial Review materials for this project. The Sam Houston State University (SHSU) IRB has determined this project is EXEMPT FROM IRB REVIEW according to federal regulations.

We will retain a copy of this correspondence within our records.

**\* What should investigators do when considering changes to an exempt study that could make it nonexempt?**

It is the PI's responsibility to consult with the IRB whenever questions arise about whether planned changes to an exempt study might make that study nonexempt human subjects research. In this case, please make available sufficient information to the IRB so it can make a correct determination.

If you have any questions, please contact the IRB Office at 936-294-4875 or [irb@shsu.edu](mailto:irb@shsu.edu). Please include your project title and protocol number in all correspondence with this committee.

Sincerely,

Donna Desforges  
 IRB Chair, PHSC

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within Sam Houston State University IRB's records

## VITA

### Kimberly Priesmeyer

#### ***Educational History***

Doctorate of Education – Educational Leadership, May 2017

*Sam Houston State University, Huntsville, TX*

Dissertation: Differences in Developmental Education Enrollment and Performance at Texas 4-Year Universities: A Multiyear, Statewide Study

Master of Arts – English, May 1994

*University of Houston, Clear Lake, Houston, TX*

Bachelor of Science – Secondary Education, English, May 1988

*Ball State University, Muncie, IN*

#### ***Professional Experience***

Associate Professor of English, Belhaven University, Houston, TX, 2006-Present

Adjunct Professor, Lone Star College, Houston, TX 2005-Present

#### ***Scholarly Publications***

Priesmeyer, K. M., & Slate, J. R. (2016). Differences in graduation and persistence rates at Texas community colleges as a function of developmental education enrollment. *International Journal of University Teaching and Faculty Development*, 5(4), 235-245. Retrieved from [https://www.novapublishers.com/catalog/product\\_info.php?products\\_id=58629](https://www.novapublishers.com/catalog/product_info.php?products_id=58629)

#### ***Presentations***

Dixon, D., Moss, S., Priesmeyer, K. M., & Stagg, D. (2014, November). *Coping Strategies: Stress in Higher Education Leadership*. Paper presented at the meeting of SERA, San Antonio, TX.

Priesmeyer, K. M. (2015, October). *Differences in Graduation and Persistence Rates at Texas Community Colleges as a Function of Developmental Education Enrollment*. Paper presented at the meeting of TCPEA, Austin, TX.

#### ***Professional Affiliations***

National Council of Teachers of English

Sigma Tau Delta, English Faculty Honor Society

National Association of Developmental Education