THE RELATIONSHIP BETWEEN CAREER AND TECHNICAL EDUCATION, AND

TEXAS ASSESSMENT OF ACADEMIC SKILLS AND OTHER

ACADEMIC EXCELLENCE INDICATORS

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This study examined the relationship between Career and Technical Education (CATE) and the Academic Excellence Indicator System (AEIS), the measure of school and learner success in Texas. CATE, an established program, traditionally encourages student achievement and perpetuates best educational practices.

AEIS data were collected by the Texas Education Agency. In addition, a survey was used to measure CATE effectiveness and the relationship between effectiveness and AEIS performance.

Two-factor mixed repeated measures ANOVAS were used to observe group differences over time. CATE and non-CATE exit level TAAS scores for reading and math at the district level were analyzed for 2000, 2001, and 2002. CATE students had higher group means, but there was no statistical significance indicating that CATE students performed as well as non-CATE students. Two-factor mixed repeated measures ANOVAS were also used for analysis of differences at the district level for attendance, dropout rates, and graduation rates. There were higher group means for attendance for CATE students, and

there was also statistical significance indicating that CATE students attended more often then non-CATE students. There was a lower group means for dropout rate, and there was also statistical significance between groups over time. This was an inverse relationship indicating that CATE students dropped out less often then non-CATE students at a statistically significant level. The graduation rate analysis showed a higher group mean for CATE students but not statistical significance. CATE students graduated at the same rate as the non-CATE group.

Pearson's r was used to correlate the relationship of the effectiveness of CATE programs with AEIS results. There was no statistical significance for reading and math TAAS exit-level tests with CATE effectiveness scores. Again there was no statistical significant relationship between CATE effectiveness and attendance and graduation. However, there was statistical significance between CATE program effectiveness and dropout correlation for 2001.

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CHAPTER 1

INTRODUCTION

Chapter 1 states the purpose and explains the need for the study. The research design follows the purpose and need and includes hypotheses, limitations, and delimitations. Definitions of terms used throughout the paper are also included. Extensive background research supported the purpose and the need for this research and is explicated in this chapter.

Significance of Study

The 21st century demands increasingly more of the education process and of the student. Paradoxically, the increasing demands on education have not corresponded to increasing student success (Chance, 1998; Hoxby, 2003). Currently critical is the need to determine which programs are successful and to examine those successful programs that impact learner success and translate into improving the quality of society. The importance of matching learner needs to curricula and societal needs, such as available jobs, cannot be overstated (Madeley, 2003; National Commission on Excellence in Education, 2003; National Commission on Excellence in Education, 1983; Sommers, 2002).

The relationship between Career and Technical Education (CATE) and the Academic Excellence Indicator System (AEIS) is important because AEIS is the measure of school and learner success in Texas. Examining the relationship between CATE and AEIS has provided support for CATE, an

established program with a goal of encouraging student achievement and perpetuating "best practices" for education that has demonstrated effectiveness through AEIS (Madeley, 2003, National Commission on Excellence in Education, 1983; National Commission on Excellence in Education 2004; Sommers, 2002).

This study focused on CATE for the following reasons: CATE programs are the historic base of education and have adapted to changing needs over time (Bailey, 1998; Scott & Sarkees-Wircenski, 2001). Also, CATE has successfully educated culturally diverse and disenfranchised learners as well as learners with special needs (Madeley, 2003; Scott & Sarkees-Wircenski, 2001). The attendance records from the Texas Education Agency as well as program funding reveal that the population of diverse and special needs learners is growing rapidly while other populations are decreasing. Programs that can respond to these growing populations of learners are needed (Quiroga, 2004; Texas Education Agency, 2003; U. S. Census Bureau, 2003). The need for special education teachers has become so great that alternative certification programs have been established by education service centers as well as by universities (United States Department of Education, 2003; Service Centers, 2003; TEA, 2003). TEA has estimated that 83,000 more teachers will be needed in Texas by 2010 (TEA, 2003).

In the 21st century, the rate of change in social and technical systems is accelerating, and the mechanization of society and work requires that all

individuals reach new levels of educational attainment. Currently, many students are struggling to learn, and what is taught may not match the current needs for employment because technology and globalization are causing major changes in all aspects of work (B. L. Brown, 1998; Sommers, 2002). Matching the curriculum to societal needs, including the job market, is critical, because changes in society and work clearly impact education (Madeley,2003; Sommers, 2002). CATE utilizes newly developed resources to ensure matches between education and the job market. The Standard Occupational Classification and the O*Net, are the electronic sources that can provide information at a rate that can keep pace with changes in the job market that require curricular change (Sommers, 2002). The multiplying effects of a lack of education and the inability to earn a living are magnified by the technological changes as well as changes in the job market (Gray, 1997; Madeley, 2003; National Commission on Excellence in Education, 1983, National Commission on Excellence in Education, 2003; Parnell, 1986; Quiroga, 2004).

Additionally, educational improvement and reform now demanded by legislation create a need for this study. Lawmakers are attempting to improve education by making educators and school systems directly accountable for learning. High-stakes testing (HST) assesses legislated educational accountability, such as the Texas Assessment of Academic Skills (TAAS), the test mandated by the Texas legislature in 1990 to measure

student competency and school accountability (Austin & Mahlman, 2002; TEA, 2003). Then federal legislation created the No Child Left Behind Act (NCLB) in 2002, extending requirements similar to the Texas accountability system to the other states (Austin & Mahlman, 2002; NCLB, 2002; TEA, 2003).

The number of culturally diverse and special needs students continues to grow rapidly in Texas (TEA, 2003). CATE helps diverse populations who historically have been excluded from education programs and historically unsuccessful in measured learning and testing (Madeley, 2003; Parnell, 1986; Scott & Sarkees-Wircenski, 2001). Learners are changing because society and technology are changing, along with the demographics. For the first time since the 19th century, the majority of Texans are not Caucasian. Changing demographics have created an increased emphasis on testing. The Texas Education Code, the Texas Education Agency, and public school law and guidelines are specific in requirements for teaching, testing, monitoring, and reporting for all ethnic groups, socioeconomic groups, and mobility groups. TEA purpose and accountability goals are designed to ensure equity for all groups. More difficult tests are now administered, and the stakes associated with these tests are high (TEA, 2003). From school funding to promotion and graduation, tests are increasingly the determiners of a student's future. Examining relationships between existing programs and test score success may be particularly significant as the transition is

made from TAAS to a purportedly more difficult test, the Texas Assessment of Knowledge and Skills (TAKS) and to an increasingly complex testing system nationwide as mandated by NCLB (Austin & Mahlman, 2002).

An important examination of the relationship among CATE, TAAS, and other Academic Excellence Indicator System (AEIS) reveals that a relationship exists between CATE, TAAS, and AEIS. AEIS data collected by the Texas Education Agency were analyzed. In addition, a survey was developed by consulting experts and by examining state and national requirements for CATE. CATE Performance and Perception Survey was emailed to CATE directors in Texas. The survey gathered information concerning CATE perception and performance measures from Texas districts. According to TEA, CATE effectiveness correlates to increased school success, as measured by AEIS and as described in chapters 4 and 5.

<center>Background</center>

Society in the 21st century is increasingly complex, with a rise in the number of individuals who are uneducated, unskilled, and unable to cope with technological change (Parnell, 1997). At the end of the 20th century, some 23 million adults in the United States could not read, write, or compute at a functional level. In 1985, 7 to 8 million people were unemployed, and another 3 to 4 million were working part-time but looking for full-time work (Parnell, 1986). According to the U. S. Census Bureau, unemployment increased by 15% in 2002 (U. S. Census Bureau, 2003). The

rate of unemployment relates to changes in work requirements and to the sophisticated skills needed for work. Societal changes highlight the changes in workforce utilization and needs (B. L. Brown, 1998; J. L. Brown & Moffet, 1999; Hoxby, 2003; Madeley, 2003). Education is essential for acquiring the skills necessary to meet the ever-changing demands of society (Brooks, 2003; Scott & Sarkees-Wircenski, 2001), and CATE provides meaningful and accessible education for diverse learners. Increasing enrollment in CATE and higher CATE performance on AEIS are both supported by data and research (Madeley, 2003; Parnell, 1997; Scott & Sarkees-Wircenski, 2001). Acquiring new skills can provide unique challenges for diverse students, and high-quality programs that incorporate best practices are needed (Turnbull, Turnbull, Shank, Smith, & Leal, 2002).

In the 21st century, new skills define the work place. Reformed and improved education helps bridge the changes in work and assist in filling the new work roles (Gardner, 1991; Parnell, 1986; U.S. Census Bureau, 2003). Also, new jobs demand greater sophistication and preparation (Gardner, 1993; Gray, 1997; Scott & Sarkees-Wircenski, 2001). Researchers have warned that, as society grows technically and scientifically more sophisticated, an increasing number of individuals will be uneducated, unskilled, and unable to cope with the changes (Gardner, 1993; Gray, 1997; Levin, 2001; Parnell, 1986).

The 1980 United States Census revealed that 17% of Americans age 24 years and older had completed college degrees. In 2000, the United States Census noted that 12% of Americans age 24 or older had completed college (U. S. Census Bureau, 2003). Approximately 75% of students are finishing high school, but fewer students are completing any postsecondary training or schooling, exacerbating economic and social problems (Gray, 1997; Hoxby, 2003; Jenkins, 1999; Levin, 2002; Madeley, 2003; Parnell, 1986). Some reports noted that the dropout rate for the largest high schools in Texas is 40% or higher. Getting students to think about how they would like to make a living and then guiding them toward their goals is crucial for both individual and public benefit (Gray, 1997). The warning that the middle class is disappearing comes with the phrase "shrinking middle class" (Gray, 1997; Hoxby, 2003; Levin, 2001; Madeley, 2003; Parnell, 1986; U.S. Census Bureau, 2002). According to Levin, the uneducated become the unemployed who need tax-supported care such as remedial education, incarceration, drug treatment, and even basic shelter and sustenance. Levin concluded that the crime rate continues to rise as friction between the affluent and the poor increases. With fewer people working and with fewer people paying taxes, social security and other federal, state, and local programs will decline while the need for funding increases (Levin, 2002).

Employees at every level must make difficult judgments while acquiring newly changing employment skills that require a trained talent

base at every level and in every type of work (Gray, 1997; Scott & Sarkees-Wircenski, 2001). With an increasingly technological society, a strong academic base is critical for the workforce. From navigating freeways to digitally connecting, education is essential, and the uneducated struggle to earn a living and function (Jenkins, 1999; Parnell, 1986).

In Vietnam in the middle of the last century, the population was 90% illiterate, with an entrenched simple agrarian existence; however, an illiterate society cannot function as a democracy (J. L. Brown & Moffett, 1999; Parnell, 1986). The illiterate cannot participate in government or experience self-determination (Sommers, 2002). Hence, teaching is central to democracy (Ravitch, 2003). The need for universal education is more critical now than at any time in history. There is relentless pressure to improve the quality of life, with education as the centerpiece of that process (Parnell, 1986). The rapid change of information systems, an enveloping technology, and a heightened diversity place intense demands on education to produce successful learners and contributing citizens (Bailey, 1998; J. L. Brown & Moffett, 1999; Gardner, 1991; Gray, Malizia, & Wang, 1998; Scott & Sarkees-Wircenski, 2001; Smith & Marsiske, 1994).

Purpose of Study

This study investigated the relationship between CATE and school success as measured by The Academic Excellence Indicator System (AEIS). Student performance on the Texas Assessment of Academic Skills (TAAS)

was analyzed for CATE and non-CATE students. TAAS was the mandated state test from 1990 through 2002 and gradually was replaced with The Texas Assessment Knowledge and Skills (TAKS) test, a more difficult test (TEA, 2002). Examining educational programs and practices and their link to TAAS success is of value in helping students and schools as the standards for programs and accountability become more rigorous. Increasingly difficult standards and accountability are required by new legislation as well as by social and economic necessity (Austin & Mahlman, 2002; Gray, 1997; Levin, 2001; Madeley, 2003).

The growing number of the disenfranchised, those who are uneducated, unemployed, and on the sidelines of society, justify the need for accountability in education. The legislation to educate an increasing number of learners more rapidly and better has produced more testing. NCLB, the federal education bill signed into law in 2000, requires states and districts to ensure that poor and minority students are not taught by unqualified, out-of-field, inexperienced teachers. Schools that do better on state standardized tests tend to have more certified and experienced teachers (TEA, 2003).

Career and technical education programs have been effective over time (Scott & Sarkees-Wircenski, 2001). The most recent research confirms that CATE incorporates best educational practices (Madeley,2003; Mendenhall,1999; Sommers,2002). Brain imagery has helped to determine

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what is *best practice* for learning. When multisensory approaches are used to construct meaning from real-world experiences that include motivational hands-on activities at the application level or higher, best practices for learning have been employed (Barbieri & Wircenski, 1990; Gardner,1991; Jensen, 1998; Madeley, 2003; Mendenhall,1999; Smutney, 2000; Winebrenner, 2001). Incorporating best practices associated with CATE into schools has the potential to improve performance. According to Levin (2001), educators do not always incorporate best practices, as supported by research. Reis, in a keynote address to the Texas Association of Gifted and Talented (TAGT) in 2002 stated, "We know what to do to educate. Many research studies support and define best practices, but those practices exist only in isolated pockets." Reis said that withholding the best educational practices was like withholding a cure from the dying (Reis, 2002). The ongoing brain research of Jensen's and Mendenhall's principles of learning during the last 10 years reflect on best educational practices that support the design of Career and Technical Education. Current studies that examine the link between CATE and student success and are needed at this time because many students are not experiencing success as measured by the completion of high school (Jenkins, 1999; U. S. Census Bureau, 2002). The lack of education exacerbates the plight of the growing homeless and institutionalized populations. In particular, Career and Technical Education may be able to expand to alleviate the loss of human potential (National

Commission on Excellence in Education, 1983). The relationship between

CATE and test scores reinforces the relationship between diverse learner

success and CATE (Madeley, 2003). TAAS has been the most prominent of

the Texas AEIS indicators, but other measures are important in order to

obtain a more complete picture of school and student success.

Assessing outcomes is essential for schools in supporting best

practices and successful programs. Accountability has always been a part of

education but never as systematically as now. Systems measure and

compare student data collectively. The data collected focus on the entire

system as well as on the individuals that create the parts of the whole (Scott

& Sarkees-Wircenski, 2001). High-stakes testing (HST), as part of NCLB and

AEIS, has created a new intensity for success as well as pressure for

comparing individuals and systems. The comparing and measuring are

highly publicized, and the level of difficulty continues to increase (Austin &

Mahlman, 2002; TEA, 2003).

In the 21st century, communities see a growing population of

uneducated, disenfranchised citizens. Community concern is manifested by

testing legislation and by the increased scrutiny of school programs. Chapter

2 in this study shows how CATE reflects best educational practices. In

addition, this study highlights a positive relationship among AEIS indicators

and CATE (Madeley, 2003; US. Dept. of Ed., 2000). Seventy-five percent of

all students will not graduate from a 4-year college. The 75% comprise the

neglected majority (Parnell, 1990). This neglected majority, including

learners with unique needs, can benefit from Tech Prep as well as other

components of CATE (Parnell, 1997). CATE, when implemented well,

incorporates best practices as identified by current research (Chance, 1998).

In addition, vocational programs are the oldest existing educational

prototypes and as such have qualities of malleability to match the change in

cultures over time (Scott & Sarkees-Wircenski, 2001). Vocational technical

programs have been able to reach populations who were labeled "not able to

learn." The disenfranchised of the past and present-women, minorities,

immigrants, the poor, and those with physical and mental challenges-have

been successful learners in vocational technical programs (Scott & Sarkees-

Wircenski, 2001). The CATE model also incorporates a strong academic

base, reaching learners in ways that create success (Barbieri & Wircenski,

1990; B. L. Brown, 1998; Chance, 1998; Education Trust, 2002; Hoxby,

2003). Vocational programs evolve with the progression of time and the

changes in cultures, and currently the CATE model meets the demand for

complex academics at the application and evaluation levels (Scott &

Sarkees-Wircenski, 2001).

Need for the Study

Education needs to employ best practices as modeled by CATE to help

more learners so that human potential is preserved. The link between CATE

and different types of learner success exists in the literature as well as in

educational data. Employers report that CATE students have better attitudes and are dependable workers (US. Department of Labor,1990). The Bureau of Labor Statistics reports that CATE graduates find employment sooner at higher wages. Links between CATE and measured learner success could be very significant by indicating which programs and practices should be sustained and replicated. Learner success affects the larger environment, from the economy to the crime rate (National Commission for Excellence in Education, 1983; National Commission for Excellence in Education, 2003). Life adjustments, including relationships and economic success, are more likely to be present when learning is successful. Clearly, identifying the educational practices and programs that implement effective strategies is critical, not only to education, but to the overall betterment of society.

Purpose of the Study

The purpose of this study was to examine Texas test scores, TAAS, at the exit level in reading and math from 2000, 2001, and 2002, in relation to CATE and other AEIS indicators, specifically attendance, graduation rate, and dropout rate. Examining the relationship between CATE and TAAS provides indicators of the relationship among CATE indicators, TAAS scores, and other variables.

Hypotheses

The following null hypotheses were examined:

Ho1: There is no statistically significant difference between CATE and non-CATE student performance on TAAS reading and math exit-level tests annually from 2000, 2001, and 2002.

Ho2: There is no statistically significant difference between CATE and non-CATE students regarding district attendance, dropout, and graduation rates for Texas from 2000, 2001, and 2002.

Ho3: There is no statistically significant relationship between effectiveness of existing CATE programs and TAAS reading and math exit-level scores for Texas districts from 2000, 2001, and 2002.

Ho4: There is no statistically significant relationship between effectiveness of existing CATE programs and other AEIS indicators: attendance, dropout rate, and graduation rate for Texas districts from 2000, 2001, and 2002.

The following hypotheses were going to be examined based on outcomes of hypotheses 1 through 4; however, the sample size was too small to label CATE programs as highly effective, effective, less effective, and not effective.

Ho5: There is no statistically significant difference between CATE students in effective CATE programs and non-CATE student performance on exit-level reading and math TAAS in Texas from 2000, 2001, and 2002.

Ho6: There is no statistically significant difference between CATE students in effective CATE programs and non-CATE students in attendance, graduation, and dropout rate in Texas between 1999 and 2002.

Limitations

This study focused on TAAS exit-level scores in reading and math and other AEIS indicators and their relationship to CATE in 9th through 12th grades from 2000, 2001, and 2002. CATE director perceptions of current CATE effectiveness and performance obtained by electronic survey were correlated to AEIS indicators to see if more effective CATE programs influenced those AEIS measures. The correlation may not be causal. In addition, the survey return was approximately 2%. Since the survey was sent at the beginning of the school year, some directors may not have had time to complete it. In addition, some technological problems have impeded the return. One district phoned to report that a new computer system was installed causing data and emails to be lost. Some districts with new technology directors did not have email addresses at the beginning of the year. One member of ACATE suggested that an email going to over 1,000 people, if designated as bulk, might be deleted. Also, districts lacking in hardware and in electronic training may not have participated. Initially obtaining the email addresses for all CATE directors was challenging. An address book was not available from TEA, and an organization directory from CATE organization would not have been inclusive. So the Region 10 CATE

contact agreed to email all service centers as well as directors in Region 10

and 11. When the surveys were not returned within 10 days, another email

survey was sent after creating an address database from TEA for districts.

The districts were asked to forward the survey to the CATE director or to the

person responsible for CATE in the district. Districts or education service

centers may not have forwarded the survey. There were 22 districts that

responded and that were matched to performance based on county district

numbers. Phone calls were made to 30 districts asking for responses. Five of

the 30 who were called did complete surveys. Ten-day response deadlines

were given after each of the emailed surveys. Three-day deadlines were

established for the districts that were phoned.

Delimitations

The present study did not address life adjustment or life satisfaction

but, rather, focused on group performance, CATE or non-CATE, on the state

test, TAAS, and other academic excellence indicators (AEIS) mandated by

the Texas Education Agency and the Texas Legislature. TAAS was required in

1990 and became more difficult in 1994 when the accountability system in

Texas added the other academic excellence indicators (AEIS). The AEIS

focus was on TAAS, but attendance, dropouts, and graduation rates were

also examined. Subgroups were not analyzed as part of this study, and

elementary and middle school students were not included. Other states and

national measures were not included. The new Texas test was not examined in this study.

Definitions of Terms

Career and Technical Education: Career and Technical Education is defined as providing a context for learning and applying academic skills, preparing people for participation in family and community, and preparing students for college and other types of learning (Scott & Sarkees-Wircenski, 200l). Other terms used for CATE today include Vocational and Technical Education, Workforce Education, and Workforce and Human Resource Education (Scott & Sarkees-Wircenski, 2001). CATE is the term used in this study. The motivational, contextual learning created by purposeful and real experiences has been known by many names and has existed in all countries and in all centuries (Scott & Wircenski, 2001).

Accelerated Schools: The term Accelerated Schools is not commonly associated with CATE but is linked by this study. Accelerated Schools refers to enriching, increasing the pace, and adding real-world education for all learners. This process both remediates and challenges learners at the level of the learner (Levin, 2001).

*Texas Assessment of Knowledge and Skills (*TAKS): This test was enacted by a bill passed by the state legislature in 1999. This statewide test was intended to measure mastery of the Texas Essential Knowledge and Skills (TEKS), the more rigorous state curriculum. TEKS and TAKS

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established a more rigorous curriculum and were designed to end social promotion.

Academic Excellence Indicator System (AEIS): AEIS is the statewide reporting of test scores, attendance, dropouts, grades, and graduation rates. Each school and district in Texas is ranked by AEIS indicators.

Best Practices: Best practices is the term used by educators and researchers to describe those practices that contribute to the highest degree of learner success.

CATE/CTE Participation: Such participation is defined as Limited, Explorer, Concentrator, and Specialist.

Limited: Carnegie units are greater than 0 but less than 3.

Explorer: Carnegie units are greater than or equal to 3 without focus.

Concentrator: Carnegie units are greater than or equal to 3 in a single labor market preparation program.

Specialists: Greater than or equal to 4 Carnegie units with two or more in advanced courses.

Non-CATE student: The Texas Education Agency has defined non-CATE students since the 1999-2000 school year as those enrolled in one or no CATE courses.

Summary

As testing becomes more rigorous and the curriculum more challenging, the ability to rely on programs that are functional and meaningful becomes more important. When human potential is lost, both individuals and communities suffer. The homeless, the incarcerated, and the institutionalized are growing populations, and if programming exists that can decrease at-risk populations by offering individuals meaningful education, then the need to examine these programs is significant. Focusing attention on the relationships among CATE, TAAS, and other AEIS indicators is important because the requirements for educational success are more challenging in a highly technical society and the testing requirements are increasingly more stringent. Examining the links to AEIS success is needed now as Texas transitions to the more difficult TAKS test.

CHAPTER 2

REVIEW OF THE LITERATURE

CATE Description

Career and Technical Education (CATE), as part of the United States education system, serves the purpose of providing learning experiences that help students explore career areas and prepare for employment and independent living. Career and technical education curricula include materials that focus on the development of basic skills, along with thinking skills and personal qualities. Also, workplace competencies and the specific skill competencies required for specific occupational areas are included, as well as core skills that can be generalized to different work situations (Jenkins, 1999; Scott & Sarkees-Wircenski, 2001). CATE focuses on knowledge, skills, and attitudes. Career and technical education programs include real-life situations in classrooms and laboratories, as well as supervised work experiences in internships, practicums, cooperative education, and apprenticeships. With real work sites, the supervised placements provide meaningful and motivational opportunities to apply academic and technical skills (Scott & Sarkees-Wircenski, 2001; Silver, Strong, & Perini, 2000). Texas Education Code 29.181 provides the following state goals for CATE:

Each public school student shall master the basic skills and knowledge necessary for (a) managing the dual roles of family member and wage

earner; and (b) gaining entry-level employment in a high-skill, high-wage job or continuing the student's education at the post secondary level.

Studies in 2003 showed that CATE's goals are being achieved at increasing levels and that current education problems are addressed by CATE programs (Chance, 1998; Madeley, 2003). Over a million students were in Texas CATE programs in 2001-2002. Clearly, CATE is exerting a major influence over educational outcomes and practices.

CATE Success

Special needs learners may learn less or not be able to learn at all without strategies of best practices supported by research (Hoxby, 2003; Mendenhall, 1999; Silverman, 1997; Smutney, 2000; Turnbull et al., 2002). Diverse learners can have increased success when best practices are used, and CATE incorporates best practices, as established by research (Turnbull et al., 2002; Wang, Haertel, & Walberg, 1998). Best practice is a phrase used to describe the curricula, the strategies, and the facilities that maximize learner success (Mendenhall, 1999). The following summary statements regarding learning underscore current best practices in education and parallel Career and Technical Education models.

Summary Learning Statements

1. People learn what is personally meaningful to them (Brooks, 2003).

2. People learn when they accept challenging but achievable goals (Davis & Rimm, 1997).

3. People learn when learning is developmental (Smutney, 2000).

4. Individuals learn differently (Turnbull et al., 2002).

5. People construct new knowledge by building on their current knowledge (Jensen, 1998).

6. Much learning occurs through social interaction (L. K. Silverman, 1997).

7. People need feedback to learn (Jensen, 1998).

8. Successful learning involves use of strategies (Winebrenner, 2001).

9. Strategies are learned (Gardner, 1991).

10. A positive emotional climate strengthens learning (L.K. Silverman, 1997).

(Mendenhall, 1999).

Education Problem

Half of all students who enter high school fail to graduate (Jenkins, 1999). The Secretary's Commission on Achieving Necessary Skills (SCANS) reports from the 1980s demonstrated that it is futile to attempt to control student dropout rates through the expansion of existing, ineffective programs. During the last 20 years, the states have generated more regulations about all aspects of education than in the previous 20 years (Chance, 1998). Some of the reform efforts practiced today are overlapping,

uncoordinated, and sometimes contradictory. The 1980s saw over 275 education task forces, but reform efforts in and of themselves do not create reform, and neither does testing. Since nationwide testing has been legislated, Texas has been a leader in the high-stakes testing (HST) movement (Austin & Mahlman, 2002; Chance, 1998). Test scores play a critical role in school, ranging from determining teacher evaluations and determining real estate values to a rank order of school districts in the state based on student scores. Testing has increased both in magnitude and in difficulty (Austin & Mahlman, 2002). Texas Assessment of Knowledge and Skills (TAKS) was mandated in 1999 by the 76th Texas Legislature and was administered in the 2002-2003 school year, replacing Texas Assessment of Knowledge and Skills (TAAS) in increments. TAKS measures statewide curricula in specified content at designated grade levels. A passing score on TAKS at Grade 11 is a prerequisite to graduation. The TAKS test requires thinking that is more critical and performance at the application level than did the previous state assessment system, Texas Assessment of Academic Skills (TAAS), was given from 1990 through 2001 in Texas (Texas Education Agency, 2003).

Prior to TAAS, Texas Educational Assessment of Minimal Skills (TEAMS), Texas Assessment of Basic Skills (TABS), and Learner Based Accountability System (LBAS) were Texas tests (TEA, 2003). Since 1980, the state of Texas has sponsored a series of increasingly difficult competency

tests (see Appendix A). Each prototype grew in level of difficulty and in complexity of administration; LBAS was optional. Now there are rigid requirements for state testing, and graduation depends on successful test performance in Texas (TEA, 2003). The rest of the United States has received a mandate in No Child Left Behind legislation to follow the Texas model of accountability, which in large part is based on testing (Austin & Mahlman, 2002; No Child Left Behind, 2002). Accountability through testing does not always produce successful education (Chance, 1998; Gardner, 1991); however, CATE programs have a record of combining successful learning with successful performance on state-mandated tests (Madeley, 2003; Ravitch, 2003: Scott & Sarkees-Wircenski, 2001).

Existing research has linked some of the best practices in education to CATE programs, which provide meaning and motivation for learners (Scott & Sarkees-Wircenski, 2001). Academic skills are best learned in a meaningful context instead of in the decontextualized manner characteristic of academic education (National Assessment of Educational Programs), and CATE programs offer the context of real-world learning (Scott & Sarkees-Wirenski, 2001). CATE provides experiences in lab settings with real tools and simulations in preparation for work placement. High Schools that Work have experienced success both in placing students for work and in creating a motivational academic learning environment. When students are aware that

learning has a purpose and can actually use the learning in real-world work situations, the results are positive (CATE, 2003).

Table 1
Best Practice Link to CATE

Practice/strategy	Researcher/study	CATE model
Active learning	Levy/Accelerated Schools Stanford(Wang, et al.,1998)	Participatory, skills based
Purposeful and meaningful	Williams,Rimm,Renzulli, and Silverman(Wang et al., 1998)	Mission, creed, interest based
Collaborative	Gardner, Delisle, Wiggins, Jacobson(Wang et al., 1998)	Student and parent organizations
Real world	Gardner, English, Davis, Rimm(Wang et al., 1998)(Davis,1997)	Project and work centered/real-life situations in laboratories and in supervised work experiences

According to the Edison Project Report, technology has been called a second language that must be acquired by employees at a user level of comfort. With the rapid change in occupations and job definitions, CATE becomes an entry point in ongoing, evolving learning (Allen, Walker, & Moorehead, 1999).

In *America 2000: An Education Strategy, Sourcebook,* core standards, measures of performance, state assessments, and program evaluation and implementation were delineated by Perkins II. Vocational supporters were serious about quality; self-indulgent program administration would not be tolerated (Hill, Harvey, & Praskac, 1991). The 1980s saw evidence of

reduced vocational enrollments related to an increased focus on academic requirements (Strickland, Elson, Frantz, & Eschevaria, 1989). In that same study, Strickland et al. reported decreasing enrollment in 31 states and increasing enrollment in 19 states, primarily in states where there had been concerted efforts to increase vocational enrollment. An examination of enrollment trends in 2000 showed a change, with more students participating (Hill et al., 1998). Levesque et al. (1995) reported an upturn in enrollment:

1. Vocational technical programs have demonstrated the ability to adapt to meet the changes and needs of the current culture.

 2. CATE programs have incorporated best practices into class offerings so that schools with quality CATE programs perform better on academic tests.

Over the last decade, educational reform has reshaped vocational technical education. Now, CATE focuses and develops the academic, vocational, and technical skills of students. The integration of academics with career and technical education has been and continues to be a powerful reform. Currently, the vast majority of high school students enroll in one or more vocational technical programs (Barbieri & Wircenski, 1990; Resnick, 1987; Scott & Sarkees-Wircenski, 2001). Ninety-seven percent of high school students in 1994 were enrolled in one or more courses. Most of these students took more than 1.0 Carnegie units of Career and Technical

Education, and more than half of all high school students took the equivalent of three or more year-long courses (Scott & Sarkees-Wircenski, 2001). In addition, the Tech Prep program and School-to-Work programs have provided a way for traditional academic students to enroll in career and technical courses (Levesque et al., 1995). The Association of Career and Technical Education (ACATE) reported that nearly two thirds of all high school graduates of Career and Technical Education programs enter some form of postsecondary education program (ACATE, 2002).

A 1991 New York study of 76,000 secondary vocational graduates found that, 6 to 18 months after graduation, 91% were productively employed or were enrolled in postsecondary education. A recent large-scale study of 13,000 Ohio vocational education graduates found that, 7 years after high school, the vocational graduates earned significantly more than a comparable group of nonvocational graduates, and the earnings gap between the two groups appeared to widen with time (ACATE, 2002). Also Gordon(2001) found that employment and salaries were higher for CATE participants and that an increasing number of students are opting to earn high school diplomas that have both an academic seal and a Career and Technical Education program seal (ACATE, 2002).

Students and parents are now more aware that job skills will be needed to fund costly postsecondary education (Ravitch, 2003). Historically, CATE focused on entry-level jobs, but during the last decade, with the

increased integration of academics into CATE programming, all aspects of industry have been represented by the academic, vocational, and technical skills of students (American Vocational Association [AVA], 1998). Two thirds of all high school graduates of career and technical education enter postsecondary programs (AVA, 1998). Now CATE includes classroom teaching, hands-on laboratory applications, supervised work experience, and career and technical student organization activities (Scott & Sarkees-Wircenski, 2001). Research indicates that these CATE components create learner success (AVA, 1998).

<div align="center">CATE Malleability and Changes</div>

Vocational technical education molds to the needs of changing cultures across time. Initially, people learned to work by imitation, followed by trial and error, apprenticeship, and organized classroom and laboratory instruction in schools. Since the Neolithic period, vocational education has existed (Scott & Sarkees-Wircenski, 2001). Educational reformers throughout history have tried to improve education, often by matching education to changes in culture and societal needs. The Smith-Hughes Act of 1917 incorporated the philosophy of Charles Prosser, and Prosser's philosophy remained the dominant force guiding vocational education until the passage of the Vocational Act of 1963 and amendments that followed. In Smith-Hughes, 16 theorems were instrumental in the formation of vocational education programs, and these theorems remain influential today (Scott &

Sarkees-Wircenski, 2001). Theorem 15 states: "Vocational education should be implemented in a flexible manner but should be grounded on sound standards and continually evaluated in order to make adjustments in light of changing employment" (Prosser & Allen, 1925, as cited in Scott & Sarkees-Wircenski, p.159). Theorem 15 reflects part of the ongoing malleability of CATE today. The Vocational Education Act of 1963 broadened the conceptions of education for work to meet the needs of different groups of people in better ways, and federal funding was eliminated for specific occupational focus in favor of more flexible organization (Scott & Sarkees-Wircenski, 2001). The National Education Act of 1998, also known as Title VIII, applied vocational funds to underserved geographic regions, individuals, and occupations. Minorities, women, and those with unique physical and mental needs have successfully participated in evolving CATE programs (Scott & Sarkees-Wircenski, 2001).

From Prosser 1925 to Perkins 1998, CATE has met diverse learner needs. Theorem 15 is viable today. The work of John Amos Comenius represents another philosophy formally entrenched in today's CATE Program. In the 1600s, Comenius believed in formal schooling, but he also believed that part of the day should be devoted to domestic work and to recreation. Comenius has been called the "father of modern pedagogy" because his structure became the basis of formal education over the last 3 centuries (Scott & Sarkees-Wircenski, 2001). An important part of Comenius's

structure was the time for work. Out of the necessity to educate a populace

for an increasingly complex workforce with an increasing need for literacy,

reformers neglected the value of vocational/technical education (Scott &

Sarkees-Wircenski, 2001). Perkins II legislation, as well as the infusion of

academics with new technologies, has revitalized vocational technical

education. In return, vocational technical education has been the ideal

vehicle to enhance the purpose and meaning of education with active,

multisensory learning. To miss either part of learning, academic or

vocational, is to be only partly educated (Gorden, 2001; Parnell, 1997).

Taking some of the major tenets of educational research and charting

these tenets to reflect CATE in the 21st century may provide significant

insight. This task can be accomplished by taking a historical perspective

from many cultures, charting apprenticeships, guilds, Sloyd, Native

American models, and many others (Scott & Sarkees-Wircenski, 2001).

CATE implements historically documented effective practices. Clearly,

the need universally to incorporate CATE into educational programs is well

documented (Davis & Rimm, 1997; Parnell, 1986; Wang et al., 1998). Since

the CATE model is established and has been successful there is an urgency

to utilize what works for learners (Reis, 2002). A 2002 Career and Technical

Education report stated that 91% of students who participated in vocational

technical programs were employed a year after completing secondary school

programs (CATE, 2002). Graduate follow-up studies have also supported the

success and effectiveness of vocational technical programs from personal and individual perspectives. The premise of infusing a model that exists and that incorporates the current research of best learning practices has the potential to help learners. Waiting to create, fund, and implement an additional prototype of best practices may not be needed.

Table 2 lists 4 of the 12 most widely implemented education programs for at-risk students as either comprehensive reforms or curricular reforms (Wang et al., 1998). The 4 programs that address comprehensive reforms are linked in the chart to CATE programs, as shown in Table 2.

Table 2
Comprehensive Reform Link to Cate

Reform	Researcher/study	CATE/link
Accelerated Schools	Hopfenberg et al. 1993(Wang et al., 1998)	Hands-on, real world, purposeful curriculum(SCANS)
Coalition of Essential Schools	MacMullen 1996 (Wang et al.,1998)	Principal's that encourage students to think critically (SCANS)
Community for Learning (previously Known as Adaptive Learning Environments Model)	Wang 1992, 1997 (Wang et al., 1998)	High academic achievement through school-wide planning structures and coordination of instruction and related achievement(SCANS)
School Development	Comer 1996 (Wang et al., 1998)	Resources of school, family, and community articulated through advisory and student groups

CATE also has the scope and the framework to facilitate learning for diverse learners. Many programs for special needs learners have tried to replicate what vocational/technical programs have already established and

incorporated. CATE, when integrated with academics and vise versa, meets

the needs of diverse populations by incorporating meaningful, contextual

experiences via an established model. From the scope of abilities to the

diversities of culture and gender, CATE matches interest to need while

motivating learners to acquire knowledge and skills that will facilitate high-

quality project completion (Scott & Sarkees-Wircenski, 2001; Smith &

Marsiske, 1994). Another ongoing positive aspect of CATE is the ability to

meet the needs of diverse learners in diverse ways. Table 3 reflects the

scope of the possibilities for CATE learners and extends to gifted and

advanced learners.

Table 3
Methods and Techniques for Gifted and Talented Students in CATE[1]

Methods/Techniques	Applications
1. CONTRACT LEARNING. This approach permits students to design and develop individual learning experiences. Typically, learning contracts spell out high interest activities that permit students to maximize their growth and achievement.	1. A student in the advanced phases of an accounting program could enter into an extra credit contract with the instructor and, by utilizing created or actual data, conduct an analysis of the financial records of a specific business. The focus would be to determine whether the record-keeping system through recording and interpreting data-was adequately assisting business in making daily decisions.

<div align="right">(table continues)</div>

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[1] Reproduced from Stone et al. (1976), p. 39-43.

Table 3 (*continued)*

Methods/Techniques	Applications
2. SELF-INITIATED LEARNING. The student seeks out an instructor and resources necessary to facilitate learning a specific skill, knowledge or concept.	2. The student in an agricultural program might further his or her knowledge in artificial insemination by contacting a veterinarian and making arrangements to obtain specific knowledge, to secure booklets and study purposes and to observe the veterinarian performing artificial insemination.
3. LEARNERS WITHOUT TEACHERS. The institution provides students with study guides to follow in studying on their own. To complete a course or program, the student must pass a comprehensive examination or demonstrate abilities and competencies.	3. A culinary arts program may enroll a gifted and talented student who desires to enrich his or her occupational preparation by learning the specialty of making pastries, which is not included in the regular curriculum. Through the technique of learning without a teacher, the student could be provided a study guide, reference materials and access to a supervised laboratory. The student would progress on his or her own in learning this specialty while pursuing the regular culinary arts program, and then be evaluated through a comprehensive examination and demonstration of skills.

Table 3 (*continued)*

Methods/Techniques	Applications
4. COOPERATIVE EDUCATION. Students are employed part-time while in school or full-time for short periods of time by a business or firm and perform tasks that provides educational preparation. The student is employed under an agreement between the student, employer and school which includes an outline of the experiences to be gained through the cooperative program.	4. The cooperative education method could be utilized to enrich any vocational program where related employment could be secured. This method could be utilized during the summer months when the regular school term is not in secession. It provides a "real world" environment for the gifted and talented student to apply his or her knowledge and skills.
5. MENTOR COUNSELOR. A knowledgeable and experienced person in the gifted and talented student's field of interest provides the student with counsel, guidance, opportunities to observe, answers to questions and other assistance in accomplishing his or her educational and career goals.	5. The mentor counselor could provide a significant avenue of enrichment for a student in a high school nurse's aide program. Through the mentor counselor, the student could become better informed about vertical articulation opportunities and educational requirements for the various employment opportunities in the health field.
6. RESEARCH PROJECTS. The gifted and talented student conducts a research project in his or her area of interest under the guidance and counsel of a more knowledgeable individual. The project might provide enrichment or curriculum being pursued or relate to supportive process enrichment.	6. A research project may be utilized in enriching a distributive education program. The student might select a given product and conduct research on customers' attitudes, likes, wants, and from this information develop a marketing program designed to increase sales of the product.

(table continues)

Table 3 (*continued*)

Methods/Techniques	Applications
7. RESPONSE ENVIRONMENT. The gifted and talented student is provided an opportunity to use free time (while other classmates are completing required work) to work with equipment, instructional materials or concepts that are significantly more advanced than the student's educational background. Through the challenge of not understanding and the desire to know, the student is led into enrichment type educational experiences.	7. The gifted and talented student in an air conditioning and refrigeration program could enrich his or her program by delving into research on solar furnaces.
8. YOUTH ORGANIZATIONS. The vocational education youth organizations provide leadership, development and enrichment opportunities for the gifted and talented.	8. The youth organization approach provides an excellent opportunity to enrich any vocational education curriculum. Gifted and talented student may increase competencies in public speaking, conducting meetings, personnel management and organization, etc.
9. COMMUNITY PROJECT. Gifted and Talented students may find enrichment experiences to supplement school activities through a community project. The project pursed (political, social, recreations, civic, or other) will determine the type of enrichment the student will receive and the project's relationship to the student's curriculum.	9. Gifted and talented students in a business management program could obtain enrichment by organizing and conducting a seminar for local businessmen. The topic could be identified by the student through contact with a representative sample of businessman and the content for the seminar could be provided by resource people.

(table continues)

Table 3 (*continued)*

Methods/Techniques	Applications
10. INDIVIDUALIZED INSTRUCTION. The many different approaches to and variations of individualized learning all provide avenues of enrichment for the gifted and talented student. Possibilities include the uses of audio tutorial materials, programmed materials, learning activity packets and any of the other commercially produced or teacher developed materials.	10. The gifted and talented student in a manufacturing technology program might enrich his or her program by pursuing individualized units of study such as Tech. Physics that relate to manufacturing. The added knowledge would enhance understanding of materials and material processing – and employability upon graduation.
11. DEVELOPMENT OF HIGHER-LEVEL COGNITIVE PROCESSES. The student is provided an opportunity to learn and practice these kills related to the processes of analyzing, synthesizing and evolution, both as separate processes and as part of the strategies of problem solving, critical thinking and creativity.	11. A home economics course in cooking could provide an opportunity for enrichment through experimental cooking. The student would have an opportunity to experiment with different ingredients and different proportion with the results being analyzed and new recipes developed.
12. ACCELERATED CONTENT. This approach allows students to work with knowledge and skills that correlate with their mental rather than chronological age, parallel their interests, and satisfy their need and use of substantive information. The gifted and talented student would advance through the regular curriculum in less time than the typical students.	12. A high school junior in a vocational electronics program could accelerate beyond the other students in the class. Through this approach, the gifted and talented student would not go beyond the regular curriculum but might complete the two-year high school vocational education program in one year.

(table continues)

Table 3 (*continued*)

Methods/Techniques	Applications
13. HIGHER DEGREE OF COMPLEXITY CONTENT. The student concentrates additional time in pursing increased depth in the unit being studied. The student may concentrate on proof of theories, application of theories or the study of specific details.	13. Hydrology and drainage is one course typically found in a civil technology program in which units of instruction for gifted and talented students could be added. For example, elementary hydraulics and the hydrologic cycle are units in the regular course of instruction. Ordinarily, the principles of hydraulics are not applied to the study of the hydrologic cycle; there is not adequate time for additional training beyond the level of the average student enrolled in the course. However, it is conceivable that units could be designed for a gifted and talented student that include the study of elementary hydraulics, the hydrologic cycle and a blending of the two, to include methods of: (1) conducting ground water investigations, (2) controlling reservoir sedimentation, and (3) preventing channel and dam scour. A student with this additional training would acquire language skills beyond what is normally obtained in preparation course, and above all, would be a greater asset to an employer involved in water resources engineering.

(table continues)

Table 3 (*continued)*

Methods/Techniques	Applications
14. WORKING WITH THE ABSTRACT CONCEPTS IN A CONTENT AREA. The student enriches his or her program by dealing with abstract ideas, theories or concepts which are inferred or discrete in the unit of instruction and which require reflective critical and creative thinking in order to make them concrete, give them meaning or make them applicable to the practical.	14. The study of display design provides the gifted and talented student with an opportunity to go beyond the regular curriculum in studying the various abstract ideas and concepts utilized in display design work and to make practical applications of the various design concepts.
15. ADVANCED LEVELS OF RESOURCES. The student is allowed to seek out and to utilized resources either human or material that go beyond the resources reserved or designed for the regular curriculum.	15. The gifted and talented student in an architectural drafting program could advance knowledge of structural theory through the utilization of textbooks in the areas of structural analysis technology. The student's preparation in statistics, the basic concepts of structural theory and their applications to statistically determined structures would be strengthened.

Methods /Techniques	Applications
16. CREATING OR GENERATING SOMETHING NEW. The students utilized knowledge and skills obtained through regular program and enrichment activities to create or develop something new.	16. The student involved in a unit of instruction utilizing the surface grinder could work on developing and making a fixture for the surface grinder to be utilized in reconditioning worn out milling machine cutters. This project would involve special machine set-ups on several machines.

Caroline Hoxby has taken United States Department of Education data and compiled information supporting the strong integration of academics into vocational/technical programs. Thus, vocational/technical education incorporates best practices and facilitates multidimensional learning (Hoxby, 2003).

Education Problem Related to Economy and to CATE

Levin (2001) was an economist from Stanford who became so concerned about education in America from an economic as well as a social perspective that he completed an additional doctorate in education because he saw education as the solution. Some of the startling revelations of Levin's research were that the numbers of poor and uneducated are multiplying, whereas the numbers of people with higher levels of income and education are declining. According to Levin, massive educational studies, pervasive accountability, and reform efforts have failed to improve measures of student success. Statistically, parents must reproduce 2.2 children in order

to maintain themselves. The upper end of the scale as measured by education and income is shrinking; those who earn $30,000 a year or more are reproducing 1.9 children. Adults with some college or with degrees are reproducing 1.7 children; families that earn less then $10,000 a year are reproducing 3.6; and families with no high school education are reproducing 4.2 (Levin, 2001). Children from middle-class families usually become successful students, whereas children from lower socioeconomic groups are not as successful, and an achievement gap exists between various ethnic and racial groups (AEIS Report Cards, 2003; U.S. Census Bureau, 2002).

The world has evolved and has become more technological, more information oriented, and more complex. An academic base is critical for all populations. From setting clocks to understanding the nuances of movies and books, increased skill levels are needed to function. In the past, the illiterate could subsist and even thrive. Today, the illiterate cannot subsist or thrive, nor can they experience self-determination and participation in government (Jenkins, 1999). The world is changing with a speed unmatched in history, and this change increases learning demands (Bailey, 1998; J. L. Brown & Moffett, 1999; Parnell, 1990; Scott & Sarkees-Wircenski, 2001; Smith & Marsiske, 1994). The middle two quartiles of the workforce must develop more sophisticated and comprehensive skills for today's technological reality (Parnell, 1997; Scott & Sarkees-Wircenski, 2001). Both the agrarian and the industrial past have been replaced by the age of

information and technology systems (Scott & Sarkees-Wircenski, 2001).

Clearly, CATE provides a vehicle to meet the challenge proposed in *A Nation at Risk.* To exclude any learner from either technology or academics is to exclude or limit that learner from participating fully in educational programming in order to succeed in life in the 21st century (Bailey, 1998; Brooks, 2003). The modern world requires a literate and educated population that can utilize the new technologies and navigate the corridors of any metropolis, megalopolis, or small town. From deciphering bus routes and parking codes to becoming a citizen in a global community, academic proficiency is required. The global community, with cultural complexities and interdependencies not possible before the advent of information highways and supersonic transports, demands literate citizens (ACATE, 2002; Bailey, 1998; Chance, 1998; Scott & Sarkees-Wircenski, 2001).

Schools and individuals as well as societies and governments are turning increasingly to education for solutions. Along with the reliance on education is the concomitant understanding of the importance of meaningful research-based education. *A Nation at Risk*, one of the definitive works of the 1980s, was one of the first studies to emphatically state that all learners should be able to complete a reasonably demanding academic curriculum. The National Commission on Excellence in Education wrote that "all students, regardless of race or class or economic status, are entitled to a fair chance and to the tools for developing their individual powers of mind and

spirit to the utmost" (National Commission on Excellence in Education, 1983). Programs must be justified on the basis of whether children make genuine gains (National Commission on Excellence in Education, 1983; Ravitch, 2003). CATE is designed to respond to the needs of diverse learners (Brooks, 2003; Scott & Sarkees-Wircenski, 2001) in part by adding relevance and purpose to learning (J. L. Brown & Moffitt, 1999; L. K. Silverman, 1997).

The learning challenges in the new millennium may be addressed by using the CATE model. Learning challenges can be overcome by using hands-on, real-world CATE experiences. Through CATE, academics become purposeful. To be able to apply learning in real settings is often exhilarating and can be highly motivational (Scott & Sarkees-Wircenski, 2001; Smith & Marsiske, 1994; Stone and Others, 1976). Also, students with exceptional needs can excel in vocational technical environments (Scott & Sarkees-Wircenski, 2001; Turnbull et al., 2002), and gifted students' unique needs may be addressed by CATE (Stone and Others, 1976). Students without exceptional needs can increase learning via CATE. Near the end of the last century, 75% of the population failed to graduate from a 4-year college (Gray, 1997; Parnell, 1986). If educators know what to do to help learners and fail to help, the lack of assistance is worse than not knowing what to do or how to help (Reis, 2002). Existing as an uneducated person in the 21st century will be difficult. The Department of Education and two studies

conducted by the National Commission on Excellence in Education found that lack of education contributes to unemployment. CATE may not cure societal ills, but CATE students find employment sooner than non-CATE students and earn more (Hill et al., 1998).

CHAPTER 3

METHODOLOGY

This study examined the relationship of Career and Technical Education (CATE) in relation to the following Academic Excellence Indicator System (AEIS) indicators: Texas Assessment of Academic Skills (TAAS) reading and math scores at the exit-level, attendance, dropout rate, and graduation rate. Those AEIS indicators were examined at the district level for CATE students and non-CATE students from 2000, 2001, and 2002. In addition, CATE programs were rated according to degree of effectiveness and related to AEIS performance.

Research Design

This study was designed to examine the effectiveness of CATE in relation to AEIS indicators by analyzing the differences in CATE student success and non-CATE student success. AEIS indicators were used to determine the degree of student success. CATE students are those with explorer status or higher: CATE student explorers (Carnegie units greater than or equal to 3 without focus), concentrators (Carnegie units greater than or equal to 3 in a single labor market preparation program), or specialist (greater than or equal to 4 Carnegie units with two or more in advanced courses). Existing AEIS data compiled by the Texas Education Agency were utilized along with surveys designed for this study and called the CATE Perception and Performance Survey, which was emailed to CATE directors.

Likert scales from this survey for perceptions of effectiveness and performance measures for CATE program change were analyzed, along with TAAS reading and math scores at the exit-level, attendance, dropout, and graduation rates for 2000, 2001, and 2002.

Population

Texas school district student enrollment in 9th through 12th grades from 1999 to 2002 was the population for the study (N=3,354,857). Percentages of students passing at the district level in Texas for TAAS exit level in reading and math from 2000, 2001, and 2002 were used, along with district percentages for attendance, graduation rates, and dropout rates. The number of school districts for those years was 1,183.

Sample

CATE district TAAS scores at the exit level for reading and math and non-CATE district TAAS scores at the exit level for reading and math were used from the districts that had complete data sets. Exact numbers of varying samples from 1170 to 1379 are stated in chapter 4 and in Table 4 for TAAS and other AEIS indicators. These were the percentage of passing scores at the district level. Effectiveness for CATE programs was examined for the 22 districts that responded to the survey and that included identifying district numbers. The survey was initially emailed to all districts by education service centers and followed up by an email from the

researcher. The response was less than 2%. Of the 1,039 districts receiving the email, 34 submitted surveys and 22 of those surveys were analyzed.

Table 4
Analysis Application and Sample Size

Analysis	Sample size CATE			Sample size non-CATE			Total
RM	TAAS Math		840	TAAS Math		536	1376
RM	TAAS Reading		843	TAAS Reading		536	1379
RM	Attend		672	Attend		677	1349
RM	DO		672	DO		677	1349
RM	Grad		672	Grad		677	1349
RM	Reading	'00	843	Reading	'00	536	1379
r	Reading	'01	843	Reading	'01	536	1379
r	Reading	'02	843	Reading	'02	536	1379
r	Math	'00	840	Math	'00	536	1376
r	Math	'01	840	Math	'01	536	1376
r	Math	'02	840	Math	'02	536	1376
r	Attend	'00	677	Attend	'00	677	1354
r	Attend	'01	677	Attend	'01	677	1354
r	Attend	'02	677	Attend	'02	677	1354
r	DO	'00	590	DO	'00	580	1170
r	DO	'01	590	DO	'01	580	1170
r	DO	'02	590	DO	'02	580	1170
r	Grad	'00	590	Grad	'00	580	1170
r	Grad	'01	590	Grad	'01	580	1170
r	Grad	'02	590	Grad	'02	580	1170

Instrumentation

The Texas Assessment of Academic Skills (TAAS) was administered between 1990 and 2002. This study focused on TAAS from 2000, 2001, and 2002 at the exit level, using reading and math scores. Released copies are available online from the Texas Education Agency, and samples are included in Appendix B. A score of 90% on TAAS is equal to 70% on the Iowa Test of Basic Skills© (ITBS©) (ITBS© Manual, 2000). TAAS measures minimal skill and knowledge. TAAS scores for reading and math at the exit level were compiled by the Texas Education Agency (TEA).

TAAS is a criterion-referenced test that was initially aligned with the Texas Essential Elements and later with Texas Academic Knowledge and Skills. Passing rates were gradually increased over time. All questions were multiple choice, and no short-answer or open-ended response items were included. The same TAAS objectives appear at each level, but instructional targets for the objectives change for different grade levels. Reliability and validity were determined by the Texas Education Agency. The objectives for reading and math exit-level tests are found in Appendix C.

The CATE Perception and Performance Survey was also utilized. There was no existing instrumentation, so a brief, direct two-part survey was created by the researcher after consulting with TEA, regional service centers, and districts. Some questions devised by Region 20 were modified for Part II of the survey. Part I asks CATE directors to respond on a Likert scale to

questions that describe the degree to which they perceive both the effectiveness and the need for program change in their districts. Part II includes performance responses that include CATE enrollment and operation questions. The CATE Perception and Performance Survey contains 20 response items that measure perception of CATE effectiveness and performance from enrollment, industry involvement, and the number of licenses and certificates earned by students. The directors rated items from 1 to 5 on a Likert scale to rank the effectiveness perceptions of district programs as well as responding to program performance. The effectiveness scores were totaled and recorded for the correlation. Since there were only 22 effectiveness scores, no standard cut-off was set for ineffective, effective, or highly effective. The effectiveness scores and the district totals were correlated with TAAS exit-level reading and math, with attendance rates, dropout rates, and graduation rates. The instrument, CATE Performance and Perception Survey, is included in appendix D.

<div align="center">Data Collection Procedure</div>

The University of North Texas Institutional Review Board (IRB) approved this research. After the IRB approval, an email was sent to all Texas CATE directors, who were asked to complete and return the survey called the CATE Perception and Performance Survey within 10 days. The surveys were available at www.coe.unt.edu/mooneyham and were submitted electronically.

Directors were asked to share district CATE performance by rating items that provided data from district reports as well as their perceptions of their district CATE program. Some of the rated items included enrollment, committee functions, committee membership, and curricula design. The Texas Education Agency lists the number of CATE students enrolled in different program areas. The agency does not currently disaggregate data for CATE and non-CATE students, but, by reentering some data and by reprogramming for disaggregating CATE and non-CATE TAAS scores for reading and math at the exit level and CATE and non-CATE dropout, graduation, and attendance rate, the data calculations were obtained. TEA disaggregated the data requested for this study for a fee.

<center>Data Analysis Procedures</center>

Survey data were analyzed using SPSS-10©. The statistics used in analyzing each hypothesis follow the restating of each hypothesis.

<center>Hypotheses</center>

Ho1: There is no statistically significant difference between CATE and non-CATE student performance on TAAS reading and math exit-level tests annually from 2000, 2001, and 2002.

For hypothesis 1 a two-factor mixed repeated measures ANOVA was used to measure the relationship between the independent variable, CATE and non-CATE students between factor, and the dependent variables of TAAS reading and math exit tests from 2000, 2001, and 2002 within factor.

<center>49</center>

The two-factor mixed repeated measures ANOVA enabled a simultaneous examination of group differences, CATE and non-CATE, and interactions across time, 2000, 2001, 2002.

Ho2: There is no statistically significant difference between CATE and non-CATE students regarding district attendance, dropout, and graduation rates for Texas from 2000, 2001, and 2002.

For hypothesis 2 a two-factor mixed repeated measures ANOVA was used to measure the relationship between the independent variable, CATE and non-CATE students between factor, and the dependent variables of attendance, graduation, and dropout rate within factor from 2000, 2001, and 2002. The two-factor mixed repeated measures ANOVA enabled a simultaneous examination of group differences and interactions across time.

Ho3: There is no statistically significant relationship between effectiveness of existing CATE programs and TAAS reading and math exit-level scores for Texas districts from 2000, 2001, and 2002.

For hypothesis 3 Pearson's product moment correlation was used to examine the relationship between the degree of effectiveness for CATE programs and the dependent variables of TAAS reading and math exit-level scores for 2000, 2001, and 2002. There were three math correlations, one for each year, and three reading correlations, one for each year. Pearson r enabled a measurement of the strength and direction of the relationship

between reading and program effectiveness and between math and program effectiveness.

Ho4: There is no statistically significant relationship between effectiveness of existing CATE programs and other AEIS indicators: attendance, dropout rate, and graduation rate for Texas districts from 2000, 2001, and 2002.

For hypothesis 4 Pearson product moment correlation was used to examine the relationship between the degree of effectiveness for CATE programs and the dependent variables of attendance, dropout, and graduation rates for 2000, 2001, and 2002. There were nine correlations, one for each year for attendance, one for each year for dropout, and one for each year of graduation rates.

The following hypotheses were not examined based on outcomes of hypotheses 1 through 4 because the sample size was too small to establish an effectiveness score and to analyze observable differences between effective CATE programs and less effective CATE programs. Hypotheses 5 and 6 were not analyzed, but are restated as follows:

Ho5: There is no statistically significant difference between CATE students in effective CATE programs and non-CATE student performance on exit-level reading and math TAAS in Texas from 2000, 2001, and 2002.

Ho6: There is no statistically significant difference between CATE students in effective CATE programs and non-CATE students in attendance, graduation, and dropout rate in Texas from 2000, 2001, and 2002.

Summary

This study was designed to examine the effectiveness of CATE in relation to AEIS indicators by analyzing the differences in CATE student success and non-CATE student success. A sample of Texas high school student scores in reading and math at the exit level for 3 years; 2000, 2001, and 2002 were analyzed to see whether there were differences across time and between groups, CATE and non-CATE students at the district level. Groups across time were also examined for differences in attendance, dropout, and graduation rates.

In addition, a researcher prepared survey was emailed to CATE directors in Texas. The results of that survey ranked CATE effectiveness among responding districts. Effectiveness rank was correlated to TAAS reading and math at the exit level. Correlations were also done to relate CATE and non-CATE to attendance, dropout, and graduation rates at the district level. SPSS© was used for all calculations.

The two-factor mixed repeated measures ANOVA was used to examine the interaction effects across time (2000, 2001, and 2002) and between groups (CATE and non-CATE). Differences between groups over time help provide insight for program support and planning (Hinkle, Wiersma, & Jurs,

1998; Leedy & Ormrod, 2001). Pearson's *r* helped to establish relationships between effectiveness and AEIS creating bivariate correlations. (Hinkle et al.,1998; Leedy & Ormrod, 2001). The linear relationships calculated by using Pearson *r* are represented in Tables 15 through 19.

CHAPTER 4

RESULTS

The purpose of this study was to investigate the relationship among Career and Technical Education (CATE), Texas Assessment of Academic Skills (TAAS), and other Academic Excellence Indicator System (AEIS) indicators. Chapter 4 presents the data collected and the findings based on those data. The chapter is arranged in order of the hypotheses presented in chapter 1. The data and results for each hypothesis are discussed following the stated hypothesis. SPSS-10 © statistical analysis software was used for all statistical analyses, and alpha was set at 0.05. In other words, the probability of making a Type I error (rejecting the null when it is false) is set at level 0.05.

An assumption of the two-factor mixed repeated measures analysis is sphericity. Mauchly's test of sphericity revealed a departure from sphericity. Therefore, the very conservative Greenhouse-Geisser correction was utilized when examining the F test. The Greenhouse-Geisser approach is used when the sphericity assumption is violated and when there is a need to adjust the df values. The reduction in the critical value's dfs is made because the assumption of sphericity is violated to the maximum extent. Greenhouse-Geisser creates a conservative F test (Type I error rate will be smaller than suggested by the level of significance).

Hypotheses

Ho1: There is no statistically significant difference between CATE and non-CATE student performance on TAAS reading and math exit level tests annually from 2000, 2001, and 2002.

Descriptive statistics for the dependent variables revealed that CATE students passed the exit-level TAAS reading and math test with a higher mean for all 3 years. An analysis of the results of the two-factor mixed repeated measures ANOVA was completed. See Tables 5 and 7. The interaction of two factors, group: CATE/non-CATE, and time: 2000, 2001, 2002 were analyzed for the TAAS reading and revealed a significant main effect for time, F (1.65,2276.43)=143.04, p<.05, eta^2=.01, but a non-significant interaction effect F(1.653,2276.43)=.93, p>.05, eta^2 = .00. There was also a significant main effect for CATE, F (1.2276,43) =17.10, p<.05, eta^2 = .01. There was not practical significance for group, time, and interaction. Group difference was also supported by mean difference, shown in Figure 1. Utilizing the mean difference and plot, CATE students were more successful in reading than non-CATE students (Tables 5 and 6, Figure 1). The resulting effect sizes (eta^2) all failed to meet the guidelines set by Cohen in 1988 that determined practical significance (Hinkle, 1998). Cohen emphasized that eta^2 values of as least .02 were needed to identify a small effect size (Hinkle, 1998). The nonsignificance has value in showing that the non-CATE group scored as well as the CATE group.

Figure 1. CATE and non-CATE district reading scores.

Table 5

TAAS Exit Level Reading CATE and Non-CATE in Texas School Districts Two-Factor Mixed Repeated Measures ANOVA

Source	SS	df	MS	F	P	eta^2
CATE	1924.39	1.00	1924.39	17.10	.00	.01
Error	1555013.99	1377.00	112.57			
Time	19452.46	1.65	11766.69	143.04	.00	.01
Time/CATE	135.10	1.64	81.72	.99	.36	.00
Error	187268.53	2276.43	82.26			
Totals	1763794.30	3657.74	13967.64			

Table 6
Mean Reading Scores for Exit-Level TAAS

	Group	M	SD	N
Reading 2000	CATE	90.99	8.75	843
	non-CATE	89.68	11.60	536
	Total	90.48	9.97	1379
Reading 2001	CATE	90.67	8.93	843
	non-CATE	88.78	12.53	536
	Total	89.93	10.43	1379
Reading 2002	CATE	95.21	5.69	843
	non-CATE	94.22	7.43	536
	Total	94.83	6.44	1379

The two-factor mixed repeated measures analysis conducted for the TAAS math test for years 2000, 2001, and 2002 revealed a significant main effect for time $F(1.53, 2107.51)=93.87$, $p<.05$, $eta^2 =.03$, but a nonsignificant interaction effect $F(1.53, 2107.51)=1.23$, $p>.05$, $eta^2 =.00$. There was also a significant main effect for CATE $F(1,2107.51)=26.98$, $p<.05$, $eta^2 =.009$. Group difference was supported by mean difference and illustrated by plot (Tables 8 and 9, Figure 2).

The resulting effect sizes for the interaction effect ($eta^2 =.00$) and the CATE main effect ($eta^2 =.10$) are according to Cohen not practically significant (Hinkle, 1998). However, the effect size for the time main effect ($eta^2 =.03$) may be considered a small to medium effect size.
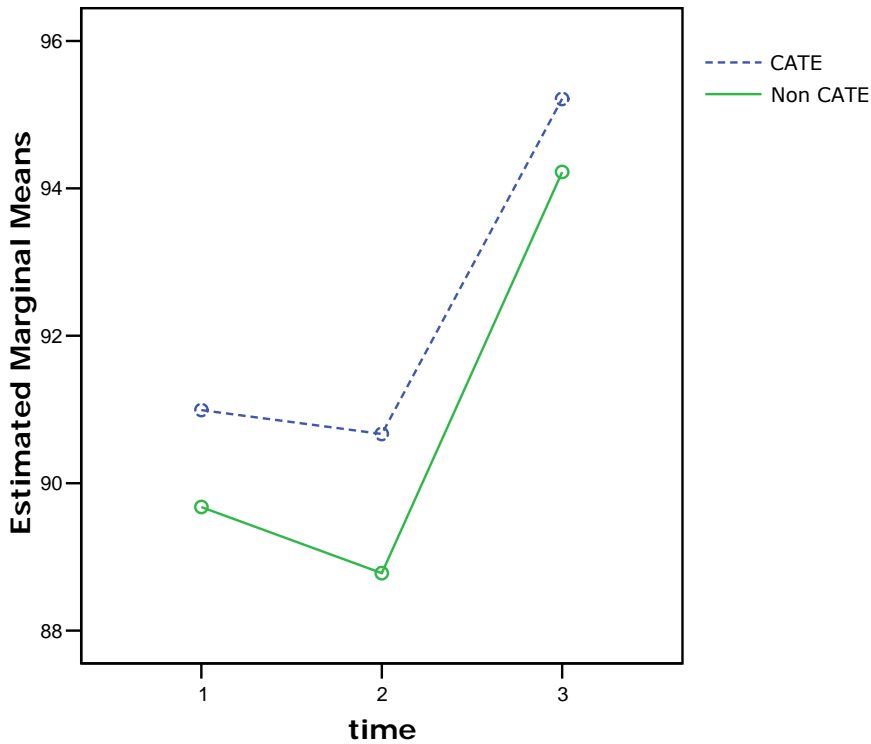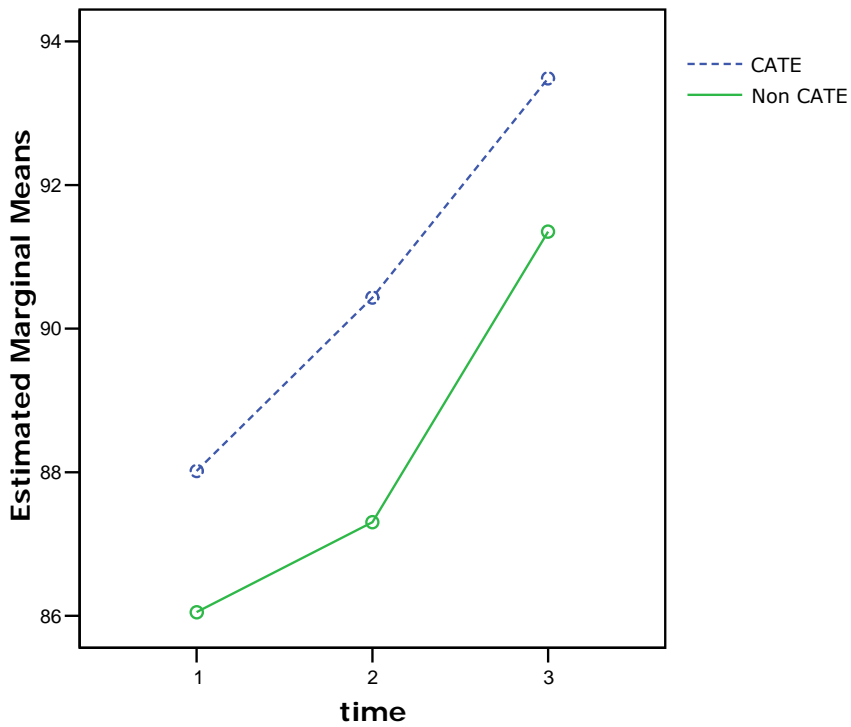
Figure 2. CATE and non-CATE math district scores.

Table 7
TAAS Exit-Level Math CATE and Non-CATE in Texas School Districts
Two- Factor Mixed Repeated Measures ANOVA

Source	SS	df	MS	F	P	eta^2
CATE	5700.29	1	5700.29	26.98	.00	.01
Error	290328.94	1.53	12789.32			
Time	19616.91	1.53	12789.32	93.87	.00	.03
Time/CATE	257.87	1.53	168.12	1.23	.28	.00
Error	287126	2107.51	136.24			
Totals	603019.97	3485.58	31583.29			

Table 8

Mean Math Scores for Exit-Level TAAS

	Group	*M*	*SD*	*N*
Math	CATE	88.02	11.05	840
2000	non-CATE	86.05	15.37	536
	Total	87.25	12.91	1376
Math	CATE	90.43	10.40	840
2001	non-CATE	87.30	16.33	536
	Total	89.21	13.08	1376
Math	CATE	93.49	7.51	840
2002	non-CATE	91.35	11.47	536
	Total	92.65	9.31	1376

Ho2: There is no statistically significant difference between CATE and non-CATE students regarding district attendance, dropout, and graduation rates for Texas from 2000, 2001, and 2002.

Descriptive statistics indicated that CATE students had higher attendance rates, graduation rates, and lower dropout rates when mean differences were examined. The differences were also observed as shown by plot (Tables 10, 11, and 12; Figures 3, 4, and 5). The two-factor mixed repeated measures ANOVA measured the interaction of two factors (group: CATE/non-CATE and time: 2000, 2001, 2002). The two-factor mixed repeated measures analysis conducted for the attendance rate for years 2000, 2001, and 2002 revealed a nonsignificant main effect for time, $F(1,1352)=2.42$, $p>.05$, $eta^2 =.00$, a significant main effect for CATE $F(1,1352)=15.10$, $p<.05$ $eta^2 =.01$, and a significant interaction effect, $F(1,1352)=4.14$, $p<.05$, $eta^2 =.00$ (Table 10). The mean difference was significant, so the data rejected the null hypothesis for attendance. This

would indicate that CATE students attended differently than non-CATE students, and the mean difference and the plots in Figure 3 show that CATE students attended more often then non-CATE students. Each of the corresponding effect sizes (CATE eta^2 =.01, attendance eta^2 =.00, CATE/attendance eta^2 =.00) failed to meet the guidelines considered by Cohen for a small effect size.
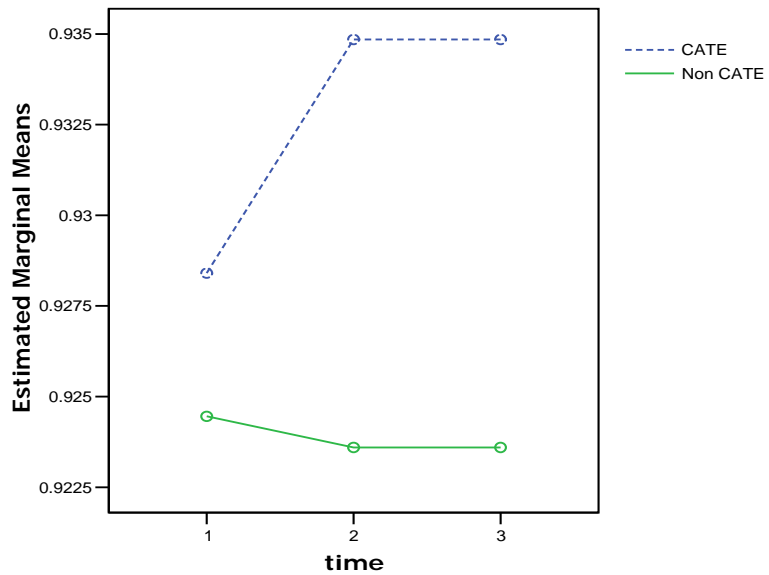

Figure 3. CATE and Non-CATE district attendance.

Table 9
Attendance CATE and Non-CATE in Texas School Districts
Two-Factor Mixed ANOVA

Source	SS	df	MS	F	P	eta^2
CATE	.08	1	.08	15.92	.00	.01
Error	6.70	1352	.01			
Time	.01	1	.01	2.42	.12	.00
Time/CATE	.01	1	.01	4.14	.04	.00
Error	3.93	1352.00	.00			
Totals	10.73	2707	.11			

Table 10
Mean Attendance

	Group	M	SD	N
Attendance 2000	CATE	.93	.10	677
	non-CATE	.93	.02	677
	Total	.93	.07	1354
Attendance 2001	CATE	.94	.05	677
	non-CATE	.92	.02	677
	Total	.93	.04	1354
Attendance 2002	CATE	.94	7.51	677
	non-CATE	.92	.02	677
	Total	.93	.04	1354

The two-factor mixed repeated measures analysis conducted for the dropout rate for years 2000, 2001, and 2002 revealed a significant main effect for time, $F(1,1168)=29.29$, $p<.05$, eta^2 =.01 (Table 12, Table13, Figure 4). A significant main effect for CATE $F(1,1168)=107.73$, $p< .05$, eta^2 =.06 and a significant interaction effect $F(1,1168) =6.08$, $p<.05$, eta^2 =.00. While the effect sizes for the interaction effect (eta^2 =.00) and

time main effect (eta^2 =.00) may not be considered small, the effect size for the main effect of CATE may according to Cohen, be considered small to medium in size. The data rejected the null for dropout rate.
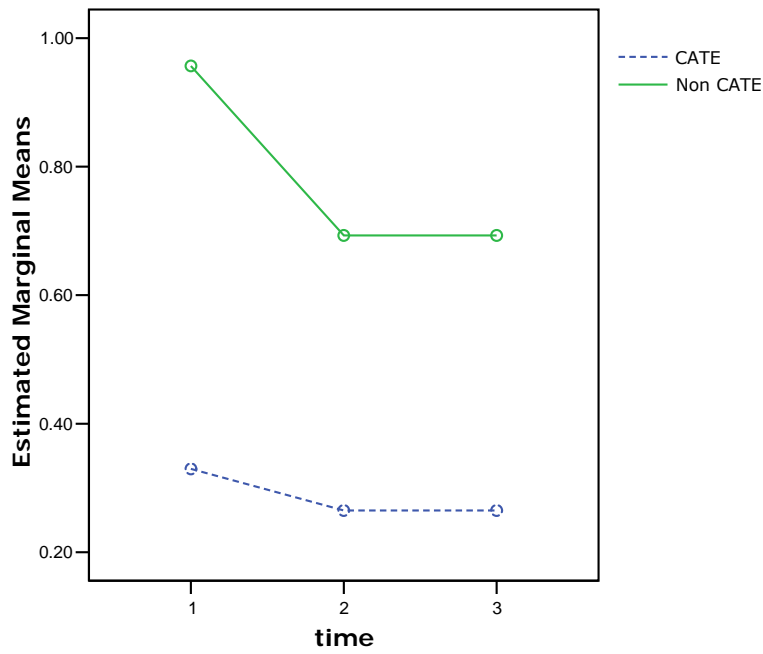

Figure 4. CATE and non-CATE district dropout.

Table 11
Dropout Rate CATE and Non-CATE in Texas School Districts
Two-Factor Mixed Repeated Measures ANOVA

Source	SS	df	MS	F	P	eta^2
CATE	331.57	1	351.57	107.73	.00	.06
Error	3594.77	1168	3.08			
Time	30.77	1	30.78	29.28	.00	.01
Time/CATE	6.39	1	6.39	6.08	.01	.00
Error	1227.27	1168	1.05			
Totals	5190.77	2338	372.86			

Table 12
Mean Dropout

	Group	M	SD	N
DO	CATE	.37	.84	590
2000	non-CATE	1.10	1.69	580
	Total	.73	1.38	1170
DO	CATE	.25	.64	590
2001	non-CATE	.81	1.41	580
	Total	.53	1.12	1170
DO	CATE	.25	.64	590
2002	non-CATE	.90	1.41	580
	Total	.53	1.12	1170

The two-factor mixed repeated measures analysis conducted for the graduation rate for years 2000, 2001, and 2002 revealed a nonsignificant main effect for time, $F(1,1168)=.34$, $p<.05$ and a significant or nonsignificant main effect for CATE $F(1.653,2276.43)=143.04$, $p<.05$, eta^2 =.18 (Tables 14 and 15; Figure 5) and a nonsignificant interaction effect $F(1,22276.43)$ 3.15, $p > .05$, eta^2 =.00. The effect size for the main effect

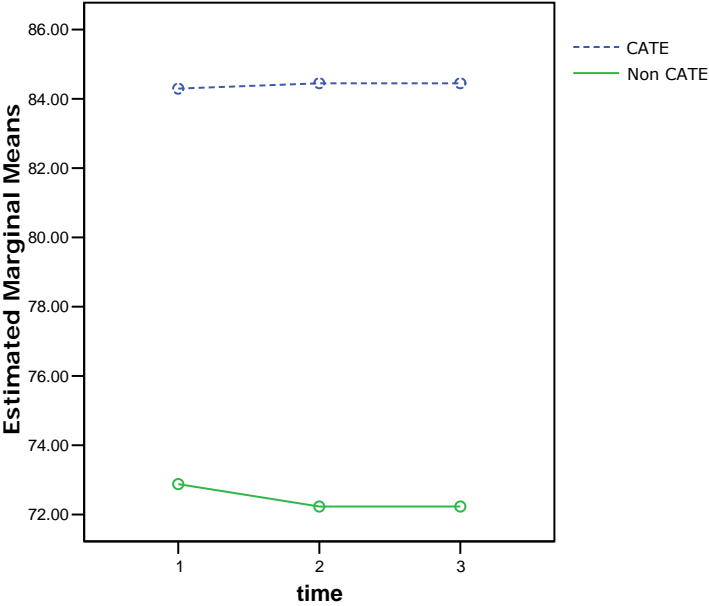CATE (eta^2 =.18) may be considered large (Hinkle, 1998). The data failed to reject the null for graduation.

Figure 5. CATE and non-CATE district graduation.

Table 13

Graduation Rate CATE and Non-CATE in Texas School Districts
Two-Factor Mixed Repeated Measures ANOVA

Source	SS	df	MS	F	P	eta^2
CATE	95063.55	1	95063.55	312.40	.00	.18
Error	355418.19	1168	304.30			
Time	23.52	1	23.52	.34	.56	.00
Time/CATE	218.05	1	218.05	3.15	.08	.00
Error	80910.74	1168	69.27			
Totals	531634.05	2339	95678.70			

Table 14
Mean Graduation

	Group	M	SD	N
Graduation 2000	CATE	91.11	7.58	590
	non-CATE	80.00	12.91	580
	Total	85.60	11.93	1170
Graduation 2001	CATE	90.76	8.47	590
	non-CATE	80.70	13.83	580
	Total	85.77	12.50	1170
Graduation 2002	CATE	90.76	8.47	590
	non-CATE	80.70	13.83	580
	Total	85.77	12.50	1170

Ho3: There is no statistically significant relationship between effectiveness score of existing CATE programs and TAAS reading and math exit-level scores for Texas districts from 2000, 2001, and 2002.

There was no statistically significant correlation between effectiveness of existing CATE programs and TAAS performance in reading and math in the years of 2000, 2001, and 2002. The data failed to reject the null hypothesis. However, even though there was no statistically significant

correlation in any year for reading or math TAAS, the correlation between

CATE effectiveness and math TAAS scores in 2000 produced a medium effect

size (r^2=.11). According to Cohen (Hinkle, 1998) an effect size of .11 in the

social sciences may be considered medium. Although no statistical

significance was revealed by the correlation coefficients, the practical

significance of this effect size may be contended.

Table 15
Correlations Between CATE Effectiveness and TAAS Reading Scores

Treatment levels	N	r	Sign (2-tailed)	(r^2)
Effectiveness and Reading 2000	22	-.02	.92	.00
Effectiveness and Reading 2001	22	.13	.56	.02
Effectiveness and Reading 2002	22	-.03	.90	.00

Table 16
Correlations Between CATE Effectiveness and TAAS Math Scores

Treatment levels	r	Sign (2-tailed)	(r^2)
Effectiveness and Math 2000	.33	.13	.11
Effectiveness and Math 2001	.30	.18	.09
Effectiveness and Math 2002	-.12	.60	.02

Ho4: There is no statistically significant relationship between

effectiveness of existing CATE programs and other AEIS indicators:

attendance, dropout rate, and graduation rate for Texas districts from 2000,

2001, and 2002.

The data failed to reject the null hypothesis in all but one case. There was a statistically significant correlation in 2000 between dropout rate and CATE effectiveness (r=.-.52). Not only is this a statistically significant result, the related effect size for this correlation (r^2=.27), according to Cohen (Hinkle, 1998), may be considered, in the social sciences, a large effect size. All other effect sizes were small to medium.

Table 17
Correlation Between CATE Effectiveness and Attendance Rates

Treatment levels	r	P (2-tailed)	(r^2)
Effectiveness /Attend 2000	.17	.45	.03
Effectiveness / Attend 2001	.24	.28	.06
Effectiveness / Attend 2002	.30	.17	.09

Table 18
Correlation Between CATE Effectiveness and Dropout Rates

Treatment Levels	r	P (2-tailed)	(r^2)
Effectiveness and DO 2000	-.52	.01	.27
Effectiveness and DO 2001	-.14	.53	.02
Effectiveness and DO 2002	-.19	.40	.0

Table 19

Correlation Between CATE Effectiveness and Graduation Rates

Treatment levels	r	P (2-tailed)	(r^2)
Effectiveness/Grad 2000	.25	.26	.06
Effectiveness/Grad 2001	.09	.71	.01
Effectiveness/Grad 2002	.13	.58	.02

The following hypotheses were not examined based on outcomes of hypotheses 1 through 4 but are restated here. The effectiveness level could not be set from the small sample.

Ho5: There is no statistically significant difference between CATE students in effective CATE programs and non-CATE student performance on exit level reading and math TAAS in Texas from 2000, 2001, and 2002.

Ho6: There is no statistically significant difference between CATE students in effective CATE programs and non-CATE students in attendance, graduation, and dropout rate in Texas between 1999 and 2002.

Summary

The data failed to reject the null for hypothesis 1. Mean differences and plots illustrate higher means for CATE students in reading and math than for non-CATE students but not at levels that were statistically significant, indicating that non-CATE students preformed as well as CATE on exit-level TAAS reading and math. The data did partially reject the null for hypothesis 2 where there was statistically significant difference for

attendance and dropout but not for graduation. The performance on AEIS showed higher means for CATE than non-CATE for the AEIS indicators of attendance and graduation. For dropout rate there was an expected inverse relationship. There was statistically significant difference for attendance and dropout indicating that CATE students attended more often and dropped out less often. For exit-level reading and math TAAS scores and for graduation rates, non-CATE students had lower group means but because there was not statistical significance the indication was that non-CATE students did as well as CATE students.

The data failed to reject the null for hypothesis 3. The effectiveness score for CATE when correlated with TAAS reading and math at the exit level did not show statistical significance although there was a medium effect size between TAAS math and CATE effectiveness in 2000. The data failed to reject the null for hypothesis 4 except in one case. TAAS attendance and graduation did not correlate at statistically significant levels with CATE effectiveness. The dropout rate for 2000 did correlate with CATE effectiveness at a statistically significant level. The small sample size for hypotheses 3 and 4 was small, and there was not statistical significance overall. Chapter 5 explains these results and offers suggestions for future studies.

CHAPTER 5

DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

This chapter summarizes the study and discusses the findings and links to previous research. Also discussed are limitations and recommendations for replication and future research.

Summary of Findings

This study focused on relationships between Career and Technical Education (CATE) and the Texas Academic Excellence Indicator System (AEIS). Whether causal or not, there were differences between CATE and non-CATE groups related to Texas Assessment of Academic Skills (TAAS), attendance, dropout, and graduation. Those differences were as follows:

1. CATE students had higher mean scores for exit-level TAAS reading and math although not at a statistically significant level, indicating that non-CATE students performed as well as CATE students.

2. When attendance was analyzed there was also higher group means for CATE, and this difference was statistically significant, indicating that CATE students attended more often than non-CATE students.

3. The dropout rate for CATE students showed a statistically significant difference. CATE students stayed in school more often than non-CATE students. The group means for the CATE students was lower for dropout since the students did not drop out as often as the non-CATE students.

4. When graduation rate was analyzed the means for CATE was higher but again not at a statistically significant level. Non-CATE students graduated at the same rate at CATE students.

Discussion of Findings

Ho1: There is no statistically significant difference between CATE and non-CATE student performance on TAAS reading and math exit-level tests annually from 2000, 2001, and 2002.

The data failed to reject the null. There was no statistical significance even though there were higher group means for CATE. This shows that the non-CATE students scored as high as the CATE students.

If CATE practices were infused to a greater degree, learning should improve and test scores should reflect that increased learning. A strong academic base is needed to function in the 21st century, and CATE's practice of linking academics to real work and real experiences supports research best practice. When students have tasks at the application level, brain chemistry (Jensen, 1998) and motivation (Levin, 2001) are affected, causing an increase in learning (Mendenhall, 1999).

During the 1980s, CATE did not change as quickly as technology and as rapidly as the job market (Chance, 1998). Many organizations and individuals fell behind the technology explosion and the change in work. However, in the transition to the 21st century, CATE has been a leader in teaching technology and in matching curricula to the job market (Sommers,

2001). One study has called technology a second language and, as such, related the need for learners to acquire technology at levels that enable comfortable use (Allen, Walker, & Moorehead, 1999).

This study as well as prior studies may be used to support funding and training so that academic teachers can teach at the application level or higher knowing that the CATE way incorporates the hands-on motivation to make academics important and meaningful (Madeley, 2003). The brain studies also indicate actual physical changes in the brain when multisensory, meaningful experiences occur (Gardner, 1991; Jenson, 1998).

Blending academics, technology, and CATE so that there are no distinctions would be meaningful. Could schools become self-sustaining learning and working communities with the students planning, leading, and performing the real work? This learning scenario is possible. In the 1980s, this researcher visited Lamplighter School, a private school in Dallas. There, the students raised chickens and marketed the eggs. The agricultural science and economic lessons were motivational, and science now knows that experiential, constructiveness learning affects brain chemistry causing more dendrites to grow (Jenson, 1998) and motivating the learners and increasing retention at the application level (Winebrenner, 2001). Those elementary students could read and compute since there was a real need to care for the chickens, sell the eggs, and make a profit. Today the Lamplighter students may be using computer programs to cost account work hours, feed, and

barn repair to determine profit accurately. The students may also have written the computer program themselves while a broadcast class produced commercials and others became Web designers. As Madeley(2003) and Sommers (2002) stated, students need to learn skills for available jobs not jobs that are obsolete.

Ho2: There is no statistically significant difference between CATE and non-CATE students regarding district attendance, dropout, and graduation rates for Texas from 2000, 2001, and 2002.

The data did partially reject the null for hypothesis 2, where there was significant difference for attendance and dropout but not for graduation. CATE students attended at higher rates and dropped out less often than non-CATE students. There was not a significant difference in graduation rates, indicating that non-CATE students and CATE students graduated with similar rates.

The Texas Education Agency was instructed to find ways to measure success for students and for schools with the ultimate goal of increasing learning success. School and individual accountability required the measurement of success. Adults and children were held accountable and punished if all groups of students were not successful at continuously raising standards (Austin & Mahlman, 2002). Attendance was important, and time on academic tasks cut recess, fine arts, and in general narrowed the curriculum so that students could be successful on state measures of

accountability. The rigorous drill and practice did not increase attendance or graduation or decrease dropouts for the groups that most needed help. When accountability for Texas schools was expanded to include attendance, dropout, and graduation rates for all subgroups, many districts received lower ratings. Levin (2001), the Stanford economist who developed Accelerated Schools reminded the education community that 85% of the learners would learn regardless of what the schools did. The hard to educate low socioeconomic group has grown, and subsequently the number of middle class students with low mobility rates is decreasing (Levin, 2001). In some high schools in the 21st century, the dropout rate is 40% (TEA, 2003). The uneducated struggle to earn a living in the complex 21st century (Gray, 1997; National Commission on Excellence in Education, 1983, 2003).

Synthesizing the research as well as the educational and employment data is a daunting task both in scope as well as in prognosis. All students, including the growing subgroups (TEA's reporting term for low SES, minority groups, and special education) must be motivated to stay in school and learn skills that can be applied in work situations. Texas demographics in schools as well as in the general populations is changing almost as rapidly as technology and job opportunities. CATE has the model in place that can help. One should examine the mean differences in this study that reflect higher attendance and lower dropout rates for CATE students. Repeated measure ANOVAS also indicate a statistical significance for CATE in relation to

attendance and dropout rates. Graduation rates had a higher mean difference for CATE students but not a statistically significant difference in the repeated measure ANOVA.

The clear implication is that in order for any schooling to be effective students must go to school and stay in school in order to graduate. Training and schooling beyond high school are needed to enter the workforce in high-wage, high-skilled work. The CATE mission is restated below:

Each public school student shall master the basic skills and knowledge necessary for (a) managing the dual roles of family member and wage earner; and (b) gaining entry-level employment in a high-skill, high-wage job or continuing the student's education at the postsecondary level. Educators have a responsibility to implement that mission for all learners.

Ho3: There is no statistically significant relationship between effectiveness of existing CATE programs and TAAS reading and math exit-level scores for Texas districts from 2000, 2001, and 2002.

There was no statistically significant correlation between effectiveness of existing CATE programs and TAAS performance in reading and math in the years of 2000, 2001, and 2002. The data failed to reject the null hypothesis. However, even though there was no statistically significant correlation in any year, the correlation between CATE effectiveness and math TAAS scores in 2000 produced a medium effect size (r^2=.11). According to Cohen (Hinkle, 1998) an effect size of .11 in the social sciences

may be considered medium. Although no statistical significance was revealed by the correlation coefficients, the practical significance of this effect size may be contended.

Research has defined best educational practices. Accelerated Schools, High Schools that Work, Coalition of Essential Schools, and Adaptive Learning Environments are comprehensive reforms that link to the mission and practice of CATE. Because CATE already incorporates the best of comprehensive reform movements in existing schools and because CATE enrollees perform better on the Academic Excellence Indicator System, the statement can be made that CATE works. Not only does CATE work to help students acquire academics but CATE students work and earn. The major mission of schools in the 21st century may well be to adopt the CATE mission and merge programs. The most effective CATE programs and administrators are needed now to serve as the models for struggling schools and students.

Ho4: There is no statistically significant relationship between effectiveness of existing CATE programs and other AEIS indicators: attendance, dropout rate, and graduation rate for Texas districts from 2000, 2001, and 2002.

The performance on AEIS showed higher means for CATE than non-CATE for all AEIS indicators examined except dropout, where there was an inverse relationship, as expected and hypothesized. There were statistically significant findings for some AEIS for varying years. TAAS scores,

attendance, and graduation rates had positive relationships to CATE, while the dropout rate showed a negative relationship, as expected. Effectiveness scores for CATE programs did have some strong positive correlations, as predicted, and a strong negative when correlated to dropout rates.

In addition, research shows that CATE students are hired sooner than non-CATE and keep their jobs longer while earning a higher wage (Sommers, 2002). These results support evidence from the literature. Some examples follow: Employers by survey attribute the group difference to the knowledge, skills, and attitudes exhibited by the CATE group. In addition, CATE students complete high school more often then non-CATE, and a larger percentage of CATE graduates pursue training or schooling after high school (Sommers, 1998).

The most effective of the CATE programs lead the way for increasing school and student success. CATE uses the Standard Occupational Classification (SOC) and the detailed database O*Net that provides detailed job descriptions help curricula to keep pace with the changing jobs. Crosswalks and pathways that are part of O*Net help to classify over 821 detailed occupations into 23 major groups (J. Silverman, 2004; Sommers, 2002). Motivating students to stay in school and learn and to enter the workforce with the skills and knowledge for available jobs is critical.

Conclusions

CATE has already accomplished what new programs and practices try to do. The recommendations and now the requirements for gifted education are the same for CATE. Parent and community advisory groups were recommended and later required for gifted students. CATE had those in place. Projects that had real meaning and real audiences were recommended/ required for gifted programs. These were in place for CATE. While gifted program teachers scrambled to find real audiences and suggest project options, CATE already had a system in place. Gifted program developers and teachers tried to find real-world hands-on projects to motivate students. What gifted programs needed to do was emulate CATE. CATE students raised animals while cost accounting records for feed and other expenses. CATE students presented at fairs and livestock shows and auctioned their animals. While gifted programs tried to find mentors and places for gifted students to intern, CATE students were working with mentors and in internships.

When the Accelerated Schools concept replaced Chapter and Title philosophies, the concept was already operative in CATE. Chapter and Title programs locked students into a low track with remedial approaches. Few if any students ever moved from the lowest groups. The accelerated approach was already operative in CATE. That approach creates interest and need for the academics by offering exciting opportunities for students to do real work

with real value. Fortunate students in Accelerated Schools are exposed to a variety of experiential opportunities by visiting workplaces as well as cultural and entertainment places that broaden the knowledge base. Students are inspired to apply new knowledge and skills while developing and changing attitudes. CATE already incorporates these broadening strategies.

Working and observing in schools causes educators to be more adamant that constructiveness opportunities should exist for all students. If a student has a certain intelligence quotient and acquires a label, then that student may work in a small group with special equipment and teachers with more training. Independent Study Mentorship(ISM) is also available for qualifying students, but ISM and internships are available to all students through CATE. A qualifying student goes on trips and makes ice cream and milks cows, while other students read about how those things are done. In CATE, any student can enroll and participate at his or her developmental level, whether counting sugar packets or isolating molecules in sugar cane to be insect resistant. In the words of Accelerated Schools, the school is ready for the student. The student does not have to be ready for school. The Accelerated Schools phrase, "no floors or ceilings" to education has meanings on many levels. First, there are no cut-offs for entry if students lack skills, hence no floor, and there are no caps for expanding beyond the usual grade requirements, hence no ceilings. Second, the learning moves

out of the school building where there are barriers, floors and ceilings, to real-world experiences.

Students could grow the food for the cafeterias, landscape the buildings, design the traffic flow, draw the blueprints, operate the libraries and offices, write books like *Foxfire* to sell, and market and sell other student-provided services. Schools could be alive with meaning and joy. Middle school students could be feeding the physically incapacitated and analyzing and working in real settings. Students with less ability could be matched to developmental tasks based on ability and interest. Observers are amazed when they view the horticulture and agricultural science classes. The finished projects and products reflect knowledge, hard work, and task commitment. Task commitment and motivation impact work as much as ability. Those with less ability who are motivated and committed may accomplish more (Renzulli, 1976).

Devoting the majority of instruction to teaching-test taking tips and narrowing the instruction to fit what will be asked on tests continues to hurt those students who most need to learn. Drilling on the test may be necessary but not at the expense of best practices.

A middle school production class for desktop publishing and broadcasting serves the school, with real-world applications from televised morning announcements created and filmed by students to Web pages and printed packets developed by students to share information with the student

body, families, and the community. There are pockets of excellence, as Reis said at The Texas Association of Gifted and Talented (TAGT) keynote address in 2002.

One should examine the performance on measured indicators where CATE scores are higher and performance is better. Many researchers have stated that measured student achievement is only a subset of actual achievement (Austin & Mahlman, 2002). Educators and students should know that CATE is a program option with a successful track record for measured achievement as well as actual achievement. Opportunities exist to inspire students with real learning situations, creating higher performance on tests without narrowing the curriculum or teaching to the test. Some test drill and information has a place, but not when that practice subsumes powerful, real-world learning.

With advisory group representation and student leadership, CATE can continue to match education to job needs while motivating student learners (Madeley, 2003; Sommers, 2002). Preparing students for work has dual benefits. Students earn and learn while in school and beyond school.

The importance is shown in Table 1, where best educational research practices are linked to CATE. CATE is modeling what other programs are trying to create. Levin (2001), Gardner (1993), Wang et al.(1998), and Rimm and Davis (1997) have researched in different studies what can be summarized as best practices. These practices are already part of CATE. As

shown in Table 3, Stone and Others (1976) expanded the dimension of CATE in a seminal work that shows how gifted learners may benefit from CATE. Hoxby (2003) and Barbieri and Wircenski (1990) discussed the integration of academics into vocational/technical programs, which has helped CATE meet the changes in the 21st century.

Levin (2002) had the vision and the insight as an economist and educator to highlight the link between education and work, while The National Commission on Education in two studies 20 years apart show that the United States is at risk if education is not successful for the majority of learners (Levin, 2002; National Commission on Excellence in Education 1983, 2004). Allen et al. (1999) labeled technology as a second language, while Barbieri and Wircenski (1990) researched vocational cooperation in integrating academics. These authors and their works and studies are providing the insights needed for improving learning. In addition, data from the Texas Education Agency (2003), Department of Education (2000), Bureau of Labor Statistics (1990), and the U.S. Census (2003) show that the less educated earn less and are less able to function in society. The link to educating learners in ways that incorporate best practice is needed now and so are studies that continue to examine performance in relation to practices.

When looking at the problems suggested by agency recorded data and seeing that learning success is possible when researched best practices are applied, one sees hope for improvement. CATE is leading the way, and the

mean differences in this study support that leadership role. Madeley (2003) has said that CATE is for all students and this researcher agrees as students struggle to find work and finance postsecondary education and training.

Recommendations for Future Research

Additional studies designed to narrow causal impacts and designed to identify ongoing links between CATE program practices and research-based best educational practices are suggested. The link to educating learners in ways that incorporate best practice is needed now, as are studies that continue to examine performance in relation to practices. The differences between CATE and non-CATE in relation to TAKS across time is needed. As CATE student enrollment increases and as CATE programs continue matching job needs and relevance, the effects may be increasingly positive. The statistical differences in this study when more effective CATE programs were examined may also be valuable to consider for future studies. Increasing the number of districts participating in the CATE Effectiveness Perception and Performance Survey would help to create a valid and reliable statistical examination of the relationship between AEIS and degree of CATE program effectiveness. When AEIS measures are high there is reason to believe that the effectiveness of CATE programs would increase, revealing a strong positive relationship. Examining the most effective CATE programs may establish an increased statistical difference between CATE and non-

CATE as well as within CATE, when more effective CATE programs are compared to less effective CATE programs.

Summary

The gap between research and practice needs to close. Educator decisions are critical and as such need to be research based. The gap may disappear when the science of learning is applied systematically by programs such as CATE. Creating new approaches to help more students may not be needed, whereas examining and supporting one of the oldest educational programs may have value. When purpose and meaning at the application level are present, learning occurs. CATE incorporates knowledge, skills, and attitudes at the application level. As a by-product, AEIS indicators have higher means for CATE students when compared with non-CATE students "Education is the basis for lifelong success. Without education we cannot become the leaders of our own fate" (Flores, as quoted by Quiroga, 2004, p. 30).

The literature links CATE with brain research and best practices that increase learning success while improving performance on high-stakes testing. The organizational support from advisory groups and student organizations as well as the infusion of technology and academics works to create an instructional model that incorporates best practices. The United States census as well as the departments of Labor, Education, and Commerce offer data that support CATE as an instructional model.

Future studies should be designed to follow CATE graduates. Existing studies show that CATE students are hired more quickly and keep their jobs longer. Employers also report that CATE attitudes support work success.

Designing studies that measure the effectiveness of various CATE programs may show that more effective programs produce even more successful learners. Continuing to retrieve and synthesize data from existing government sources may also provide valuable information for educational program results.

APPENDIX A

TEXAS TESTING TIMELINE

Timeline of Testing in Texas

1979 TABS (Texas Assessment of Basic Skills) Test:
The legislature passed a bill requiring basic skills competencies in math, reading, and writing for grades 3, 5 and 9. Because there was no state-mandated curriculum at that time, the learning objectives for the TABS were created by committees of Texas educators. In 1983, the Texas Legislature began requiring retesting. Although TABS was not a "diploma-denial test," 9th grade students who did not pass the test were required to retake the exam each year thereafter while in school. Because results were reported, the TABS test was the beginning of "high stakes" accountability for school districts.

1984 TEAMS (Texas Educational Assessment of Minimum Skills) Test:
The legislature changed the wording of the Texas Education Code, requiring the assessment program to measure "minimum skills" rather than " basic skills competencies." The TEAMS test began in the 1985-86 school year, replacing the TABS. It sought to increase the rigor of the state assessment and added individual student sanctions for performance at the exit level. TEAMS tested math, reading, and writing, and was administered to students in grades 1, 3, 5, 7, 9 and 11, with the 11th grade testing being the "exit level" assessment. The class of '87 became the first class in which students were required to pass the exit level exam in order to receive a diploma.

1990 TAAS (Texas Assessment of Academic Skills) Test:
Changes in state law required the implementation of a new criterion-referenced program. The TAAS test shifted the focus from minimum skills to academic skills, which represented a more comprehensive assessment of the state-mandated curriculum, the Essential Elements. TAAS assessed higher-order thinking skills and problem-solving in math, reading and writing for grades 3, 5, 7, 9, and 11 exit level. The board considered the following factors when establishing the levels of satisfactory performance. First, the TAAS assessed a broader range of the Essential Elements than TEAMS did. Second, in comparison to TEAMS, the TAAS test items were more difficult. Third, the TAAS served multiple purposes by providing scores and consequences at the student level, the school level, and the district level. Due to these factors, the board set a one-year interim standard for satisfactory performance.

1992-1993 TAAS transitioned from a fall to a spring testing program, and in 1993- 1994 assessment was expanded to include grades 3-8 in reading and math. The writing test was moved to grades 4 and 8, and the exit level test was moved from grade 11 to grade 10.

1993 The legislature enacts the creation of a new statewide-integrated accountability system that includes the rating of campuses and districts. The inclusion of TAAS in the accountability system, the public release of

performance results, and the exit-level requirement for graduation makes TAAS the most "high stakes" assessment in Texas history.

1994 The board voted to align the passing standards at grades 3-8, with the standard being established at the exit level. This new standard, the Texas Learning Index (TLI), allowed comparisons of achievement across grades while maintaining the same passing standards for exit level students. The TLI helped districts to determine whether each student was making the yearly progress necessary to meet minimum expectations on the exit level reading and math test in 10th grade.

1995 Science and social studies were added to the eighth grade TAAS test.

1999 TAKS (Texas Assessment of Knowledge and Skills) Test:

Development of the Texas Assessment of Knowledge and Skills (TAKS) test begins.

The legislature passed bills ending social promotion and creating a more rigorous testing program (Texas Education Code, Chapter 39 and 28 respectively). As mandated by the 76th Texas Legislature, the Texas Education Agency begins to develop a new assessment program, the Texas Assessment of Knowledge and Skills (TAKS), to be aligned with the state-mandated curriculum, the Texas Essential Knowledge and Skills.

Under the new law, students in grades 3 (reading), 5 and 8 (reading and math) will be required to demonstrate proficiency on a state assessment test, and achieve passing grades in order to advance to the next grade level. At the 11th grade (reading, writing, math, science and social studies) students must pass the TAKS test , in addition to receiving the required number of credits, in order to receive their high school diploma. The Texas Education Code (TEC) charges the State Board of Education with establishing the passing standards (performance standards) on the new TAKS test.

2002 Spring of 2002 is the last administration of the TAAS test. Exit level students who fail any subject area test will continue to retest.

TAKS is field-tested across the state of Texas and will become the new statewide

assessment program to be administered beginning in the 2003 school year.

February-May 2002 Statewide field testing for grades 3-11 is conducted in order to collect student performance data on test items.

November 2002 The State Board of Education is expected to set passing standards for the new TAKS test.

Spring 2003 is the first live administration of the TAKS test which will generate scores that count for students.

APPENDIX B

TEXAS ASSESSMENT OF ACADEMIC SKILLS RELEASED TEST

TEXAS ASSESSMENT OF ACADEMIC SKILLS
EXIT LEVEL
Administered February 2001
STUDENT NAME
TEKS Based

Page 3
Writing
PART 1
Page 4
DIRECTIONS
Read the passage and choose the word or group of words that belongs in each space. Mark the
letter for your answer.
Read the passage and decide which type of error, if any, appears in each underlined
section. Mark the letter for your answer.
There is nothing like spring in Texas.
Wildflowers (SA-1) plain fields of grass into
oceans of blue, pink, and yellow. A walk among
the blossoms (SA-2) by their pleasant perfume.
A Texas spring is an unforgettable time of year.

SA-1 A was transforming
B transform
C transforms
D has transformed

SA-2 F is sweetened
G was sweetened
H had sweetened
J will sweeten

The student volunteers climbed wearily toward the truck. They loaded it
with bags full of discarded bottles cans, plastic, and paper. As the truck
drove away,
(SB-1)
the students looked proudly at the vast, unlittered beach. The cleanup had
been
(SB-2)
a success!

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SB-1 A Spelling error
B Capitalization error
C Punctuation error
D No error

SB-2 F Spelling error
G Capitalization error
H Punctuation error
J No error

SAMPLE A
SAMPLE B
Page 5
SAMPLE C
Read the passage. Some sections are underlined. The underlined sections may be one of the
following:
• **Incomplete sentences**
• **Run-on sentences**
• **Correctly written sentences that should be combined**
• **Correctly written sentences that do not need to be rewritten**
Choose the best way to write each underlined section and mark the letter for your answer. If the
underlined section needs no change, mark the choice "Correct as is."
Despite their awkwardness on land. Penguins are very efficient predators. Once in the ocean these
(SC-1)
clumsy-looking birds turn into well-coordinated athletes. Penguins use their flippers. They use them to
(SC-2)
propel themselves in search of their prey. In addition to fish and squid, they successfully hunt krill, tiny
shrimplike animals. In the water, at least, penguins do not resemble windup toys in tuxedos!
(SC-3)

SC-1 A Despite their awkwardness on land
penguins. Are very efficient predators.
B Despite their awkwardness on land,
penguins are very efficient predators.
C Despite their awkwardness. On land
penguins are very efficient predators.
D Correct as is

91

SC-2 F   Penguins use their flippers to propel themselves in search of their prey.
G Penguins, they use their flippers to propel themselves in search of their prey.
H Using their flippers to propel themselves in search of their prey are penguins.
J To propel themselves in search of their prey are penguins using their flippers.

SC-3 A In the water, at least, penguins do not resemble windup toys. In tuxedos!
B In the water, at least, penguins, not resembling windup toys in tuxedos!
C In the water, at least. Penguins do not resemble windup toys in tuxedos!
D   Correct as is

Page 6
Read each passage and choose the word or group of words that belongs in each space. Mark the letter for your answer.

4 F feels
G   feel
H is feeling
J was feeling

3 A   particularly
B particular
C most particular
D more particular

2 F his
G   their
H her
J your

1 A certify
B certified
C certifiably
D   certification

Last summer Arthur volunteered to work at a camp for disabled children. He enjoyed it so much that he is working there again this summer. Because he has earned   (1)   as a swimming instructor, Arthur teaches the children to swim. Some of the children's disabilities have little effect on   (2)   ability to swim. In fact, Arthur teaches deaf children to swim in much the same way that he instructs hearing children. He   (3)   enjoys helping children with physical disabilities gain confidence in the water. Once these children   (4)   secure in the water, they find it is much easier to move in the pool than out of it. Arthur finds working with disabled children so rewarding that he plans to study physical therapy after he graduates from high school.
Page 7

8 F our
G their
H your
J   its

7 A reliablest
B   most reliable
C reliably
D more reliable

6 F original
G originally
H   origins
J originate

5 A referred
B will refer
C were referring
D   refer

The English language is filled with colorful phrases that don't mean exactly what they say. When people   (5)   to a "chip off the old block" or "letting the cat out of the bag," they are certainly not talking about wood

93

chips or cats! Some of these idioms, as such expressions are called, have their (6) far back in time. For instance, the phrase "straight from the horse's mouth" means getting information directly from the (7) source. The popular explanation of this idiom dates back to the days when horses were a primary form of transportation and were frequently sold or traded. If a buyer suspected a seller was being dishonest about the age of a horse, the buyer would open the horse's mouth to examine the size and shape of (8) teeth. This would help determine the horse's age. As a result, truthfulness became associated with the horse's mouth.

Page 8

12 F them
G him
H it
J her

11 A is willing
B are willing
C was willing
D has been willing

10 F promotional
G promotionally
H promotion
J promoting

9 A encouraged
B had encouraged
C was encouraging
D will encourage

The Milam High School Student Council members want to start a service project that will promote the prevention of some childhood injuries. The students have decided to sponsor a program that (9) children to wear helmets when riding bicycles, skateboards, or in-line skates. Student Council members are

planning to secure permission from local
elementary schools to distribute flyers   (10)
helmet use. In the meantime the students will
try to find supportive businesses that   (11)
to donate helmets. Finally the students will go
to each elementary school to demonstrate the
proper use of helmets. At the schools, students
plan to distribute the helmets that have been
donated. They hope that they can carry out
their project successfully. If so, they can
extend   (12)   to involve middle school
students the following year.
Page 9
Read each passage and decide which type of error, **if any**, **appears in each underlined**
section. **Mark the letter for your answer**.
16 F Spelling error
G Capitalization error
H   Punctuation error
J No error

15 A   Spelling error
B Capitalization error
C Punctuation error
D No error

14 F Spelling error
G Capitalization error
H   Punctuation error
J No error

13 A Spelling error
B   Capitalization error
C Punctuation error
D No error

"Go ahead, Dustin. You can do it!" bellowed Mr. Davidson from behind me.
"It's guaranteed to be safe. All of my scouts have constructed these rope bridges, and I
built them in the U.S. marines before that. I've never known one to collapse."
(13)

Why did I have to go first? I didnt even like heights. The ropes creaked when I
(14)
stepped onto them. How could they posibly hold my weight?
(15)
"Just find the center" yelled the scoutmaster. "Hold the ropes on both sides and keep
(16)
to the middle."
The contraption rocked as I stepped, but I was determined to keep going. Shuffling
from one foot to the other, I refussed to look down into the water. Finally I reached the
(17)
other side.
"Okay!" I waved for the next scout to come and wiped the sweat from my forehead. I had overcome my fear!
17 A Spelling error
B Capitalization error
C Punctuation error
D No error

Page 10
21 A Spelling error
B Capitalization error
C Punctuation error
D No error

20 F Spelling error
G Capitalization error
H Punctuation error
J No error

19 A Spelling error
B Capitalization error
C Punctuation error
D No error

Many important historical events have taken place in Maryland, and several hundred
roadside markers have been erected to note these events. However, many of the markers have
been neglected and are now in need of repair. As a service to the state, a resedent named

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(18)

Cecil Boblitz has volunteered to help restore these highway emblems. He removes the signs,

(19)

repairs them, and then reinstalls them in places that are highly visible to motorists.

This mans restoration efforts are taking place just as the popularity of "heritage tourism"

(20)

is increasing. This type of tourism encourages people to travel the back roads

in order to discover the locations where important things happened in the past.

Boblitz feels these markers make excellent history teachers, enabling people of all ages

to learn about america's heritage while they travel.

(21)

18 F   Spelling error
G Capitalization error
H Punctuation error
J No error

Page 11
26 F   Spelling error
G Capitalization error
H Punctuation error
J No error

25 A Spelling error
B Capitalization error
C Punctuation error
D   No error

24 F Spelling error
G Capitalization error
H   Punctuation error
J No error

23 A Spelling error
B   Capitalization error
C Punctuation error
D No error

22 F Spelling error
G Capitalization error
H Punctuation error
J No error

Carrying two suitcases, a jacket, and a book, Tom Jackson hurried through
San Antonio International Airport. As soon as he got outside, he climbed into
a taxi.
When he arrived at his hotel, he paid the driver collected his belongings, and
went
(22)
inside. Tom soon made a startling discovery. In his rush to get to the hotel,
he had
misplaced his wallet.
Tom immediately contacted the Police, but he was sure he would never see
(23)
his wallet again. As he stood in the lobby waiting for an officer to arrive Tom
noticed
(24)
the taxi driver walking toward him. The driver had found Tom's wallet in the
backseat
(25)
of his cab and had returned to the hotel to find him. Tom felt lucky. He had
not only
gotten his wallet back, but he had also met a very honorible man.
(26)

Page 12
**Read each passage. Some sections are underlined. The underlined
sections may be one of the
following:**
• **Incomplete sentences**
• **Run-on sentences**
• **Correctly written sentences that should be combined**
• **Correctly written sentences that do not need to be rewritten**
**Choose the best way to write each underlined section and mark the
letter for your answer. If the
underlined section needs no change, mark the choice "Correct as is."**

On a class trip to the Texas State Aquarium in Corpus Christi, I learned
many
fascinating facts about marine life. The most unusual thing I learned is that
many shark

species don't sleep! In fact, most sharks must stay in motion continuously. In order to
(27)
survive. Our guide explained one reason that sharks must keep moving. Most fish
(28)
have a special internal organ. This organ is sac-like and is called a swim bladder. It
stores air much like a balloon does, allowing the fish to stay afloat. However, sharks do
(29)
not have swim bladders, they must keep swimming, or they will sink to the bottom of the
ocean. At first I felt sorry for the sharks. But as I watched them glide through the water, I
(30)
realized that for them perpetual motion is just a part of everyday living.

28 F Most fish that have a special internal
organ have a sac-like swim bladder.
G Most fish have a special internal organ,
and this organ is sac-like, and it is called
a swim bladder.
H Most fish have a special sac-like internal
organ called a swim bladder.
J Most fish have a special internal organ
because it is a sac-like swim bladder.

29 A However, sharks do not have swim
bladders. And must keep swimming or
sink to the bottom of the ocean.
B However, sharks do not have swim
bladders, so they must keep swimming.
Or they will sink to the bottom of the
ocean.
C However, sharks do not have swim
bladders. They must keep swimming, or
they will sink to the bottom of the ocean.
D Correct as is

30 F But as I watched them glide through the
water. I realized that for them perpetual
motion is just a part of everyday living.
G But as I watched them glide through the

water, realizing that for them perpetual motion is just a part of everyday living.
H But as I watched them glide through the water, I realized something, for them perpetual motion is just a part of everyday living.
J Correct as is

27 A In fact, most sharks must stay in motion continuously, this is in order to survive.
B In fact, most sharks must stay in motion continuously in order to survive.
C In fact, most sharks staying in motion continuously in order to survive.
D Correct as is

Page 13
33 A However, when the boys stood face-to-face and put all six balls in motion. The children applauding wildly.
B However, when the boys stood face-to-face and put all six balls in motion, the children applauding wildly.
C However, when the boys stood face-to-face and put all six balls in motion, the children applauded wildly.
D Correct as is

32 F For many weeks they practiced the basic techniques, and they worked hard on them to master them.
G For many weeks they practiced the basic techniques, working hard to master them.
H For many weeks they practiced the basic techniques, although they worked hard to master them.
J For many weeks they practiced the basic techniques of working hard to master them.

31 A Because they had an idea, Sam and Alex Jackson watched a juggler on TV.
B Sam and Alex Jackson watched a juggler on TV, but then they had an idea.

100

C Sam and Alex Jackson watched and had
an idea about a juggler on TV.
D After watching a juggler on TV, Sam and
Alex Jackson had an idea.

Sam and Alex Jackson watched a juggler on TV. Then they had an idea. They thought they could
(31)
make money by developing their own juggling act. The boys bought kits containing juggling balls and
instructions. For many weeks they practiced the basic techniques. They worked hard to master them.
(32)
They then began to perfect an act that would entertain audiences.
Three months later the Jackson Jugglers got an opportunity to perform at a neighborhood
birthday party. When Sam and Alex appeared in their clown costumes and pretended to be unable to
juggle, the children howled with laughter. However, when the boys stood face-to-face and put all six
(33)
balls in motion. The children applauded wildly.
By the end of the afternoon, the Jackson Jugglers had been invited to perform at three other
birthday parties. Their new business was off to a great start.

Page 14
35 A Jet contrails are the long white streaks in
the sky that appear to be trailing behind
airplanes.
B Jet contrails are long white streaks in the
sky because they appear to be trailing
behind airplanes.
C Jet contrails are long white streaks
trailing behind airplanes that appear to
be in the sky.
D Jet contrails are the streaks in the sky,
long and white and appearing to be
trailing behind airplanes.

34 F Meteorologists have suspected for years
that the answer to this question is yes.
Recent evidence indicating that they may
be right.

G Meteorologists have suspected for years that the answer to this question is yes, and recent evidence indicates that they may be right.

H Meteorologists have suspected for years that the answer to this question is yes, and recent evidence indicates. That they may be right.

J Correct as is

Do airplanes make the sky cloudier? Meteorologists have suspected for years that the answer to
(34)
this question is yes, recent evidence indicates that they may be right. The planes themselves don't
actually increase cloudiness, but the contrails produced by their engines do. Jet contrails are long white
(35)
streaks in the sky. They appear to be trailing behind airplanes. Contrails are created when vapor from
jet exhaust cools and condenses into ice crystals. While some contrails quickly evaporate and disappear,
some linger and eventually develop into cirrus clouds. These clouds can cause temperature changes.
(36)
Either by reflecting radiation from the sun or by holding it in. Experts plan to conduct more research to
discover the extent to which jet contrails affect cloud cover and produce climate changes. It seems that
(37)
airplanes may be changing not only the way we travel but also the environment in which we live.

37 A It seems that airplanes may be changing not only the way we travel, may also be changing the environment in which we live.

B It seems that airplanes changing not only the way we travel but also the environment in which we live.

C It seems that airplanes may be changing not only the way we travel. But also the environment in which we live.

D Correct as is

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36 F These clouds causing temperature changes either by reflecting radiation from the sun or by holding it in.
G These clouds can cause temperature changes, they either reflect radiation from the sun or hold it in.
H These clouds can cause temperature changes either by reflecting radiation from the sun or by holding it in.
J Correct as is

Page 15
BE SURE YOU HAVE RECORDED ALL OF YOUR ANSWERS ON THE ANSWER DOCUMENT.
Page 16
40 F Because of the efforts of this dedicated conservationist, the Texas tortoise. It will surely have a better chance for survival.
G Because of the efforts of this dedicated conservationist. The Texas tortoise will surely have a better chance for survival.
H Because of the efforts of this dedicated conservationist, the Texas tortoise surely having a better chance for survival.
J Correct as is

39 A The Turtle Ranch serves as a hospital for sick tortoises because it was built by a biology professor named Francis Rose.
B Serving as a hospital for sick tortoises, it was built by a biology professor named Francis Rose, and it is the Turtle Ranch.
C Built by a biology professor named Francis Rose, the Turtle Ranch serves as a hospital for sick tortoises.
D The Turtle Ranch serves as a hospital for sick tortoises that was built by a biology professor named Francis Rose.

38 F Just outside San Marcos, Texas. There is a 4,000-acre spread that is one of the most unusual ranches in Texas.
G Just outside San Marcos, Texas, is a

103

4,000-acre spread, it is one of the most
unusual ranches in Texas.
H   Just outside San Marcos, Texas, is a
4,000-acre spread that is one of the most
unusual ranches in Texas.
J Correct as is

Just outside San Marcos, Texas, is a 4,000-acre spread. One of the most unusual
(38)
ranches in Texas. This ranch is a sanctuary for an endangered reptile species known as the
Texas tortoise. The Turtle Ranch serves as a hospital for sick tortoises. It was built by a
(39)
biology professor named Francis Rose. Rose cares for tortoises brought there and also
conducts research to find a cure for a recently discovered tortoise disease called mycoplasma.
Concerned about the survival of Texas tortoises, Rose reminds people that it is against
the law to capture or interfere with these animals in their natural habitat. He says tortoises
are better off when they are just left alone. Because of the efforts of this dedicated
(40)
conservationist, the Texas tortoise will surely have a better chance for survival.

Page 17
WRITING
PART 2
Page 18
BE SURE YOU HAVE WRITTEN YOUR COMPOSITION ON
THE TWO LINED PAGES ON THE ANSWER DOCUMENT.
A committee is putting together a collection of objects that represent what life is like in
America today.
Think of **one** object that should be included in this collection. Write a letter to convince
the members of the committee that the object you have chosen represents America today. Be
sure to support your choice with convincing reasons and to explain your reasons in detail.

MATHEMATICS

DIRECTIONS
Read each question and choose the best answer. Then mark the letter for the answer you have chosen. If a correct answer is not here, mark the letter for "Not Here."

SAMPLE D
Hank learned in science class that a common flea can jump up to 220 times its body length. Hank is 5.5 feet tall. If he could jump 220 times his height, what would be his maximum jumping distance?

A 1100 ft
B 1210 ft
C 12,320 ft
D 14,300 ft

SAMPLE E
Clarissa's bicycle repair bill was $14.48. She had $5.52. How much more money did she need to pay her bill?

F $8.96
G $9.16
H $9.96
J $20.00
K Not Here

SAMPLE F
Mario is saving part of his paycheck each week to buy a stereo that costs $119.50. Last week he worked 38 hours and was paid $4.50 per hour. Which number sentence could be used to find P, the amount in dollars Mario earned last week?

A $(38)(4.50)$ P
B P
C 119.50 38 4.50 P
D 119.50 $4.50 - 38$ P
E 38 4.50 P

4.50
38
FORMULA CHART
EXIT LEVEL
Perimeter square $P = 4s$
rectangle $P = 2(l + w)$
Circumference circle $C = 2\pi r$
Area square $A = s^2$
rectangle $A = lw$ or $A = bh$
triangle $A =$
trapezoid $A = (b + b)h$
circle $A = \pi r^2$
Surface Area cube $S = 6s^2$
cylinder (lateral) $S = 2\pi rh$
Volume rectangular prism $V = lwh$
cylinder $V = \pi r^2h$
cube $V = s^3$
Pythagorean Theorem right triangle $a^2 + b^2 = c^2$
MEASUREMENT CONVERSIONS
METRIC CUSTOMARY
Length 1 kilometer = 1000 meters 1 mile = 1760 yards
1 meter = 100 centimeters 1 mile = 5280 feet
1 centimeter = 10 millimeters 1 yard = 3 feet
1 foot = 12 inches
Volume and 1 liter = 1000 milliliters 1 gallon = 4 quarts
Capacity 1 gallon = 128 ounces
1 quart = 2 pints
1 pint = 2 cups
1 cup = 8 ounces
Weight 1 kilogram = 1000 grams 1 pound = 16 ounces
and Mass 1 gram = 1000 milligrams 1 ton = 2000 pounds
Time 1 year = 365 days
1 year = 12 months
1 year = 52 weeks
1 week = 7 days
1 day = 24 hours
1 hour = 60 minutes
1 minute = 60 seconds
12
bh
2
1 2

1 Which set of data appears to have all of its points on the line graphed below?

A

B

y
x
−5
−4
−6
−7
−8
−9
−3
−2
−1
0
1
2
3
4
5
6
7
8
9
−1 1 −2 −3 −4 −5 −6 −7 −8 −9 2 3 4 5 6 7 8 9

C

D

x y
−1
−7
5
4
−4
0

x y
−2
−4
0
5
−1
2

x y
−4
−2
2
−2
2 2
x y
−1
−2
2
3
−3
0
Page 25
3 The results of a survey indicate that approximately 627,000 people in a state own dogs. Which expression shows this number in scientific notation?

A 6.27 $10 - 5$
B 6.27 $10 - 4$
C 6.27   10 4
D   6.27   10 5

2 Which expression is the ***sixth*** term in this pattern?

, , , , …
F
G
H
J

64*a* 14
b 7
2*a* 2
b
4*a* 4
b 2
8*a* 6
b 3
16*a* 8
b 4
64*a* 12
b 6
128*a* 12

b 6
128*a* 14
b 7
4 If the diagonal of a television screen is
20 inches and the width is 16 inches, what
is the height of the screen?
F 6 in.
G 8 in.
H   12 in.
J 18 in.

16 in.
20 in.
Page 26
5 The chart shows the number of orchestra members there are in each
section of the Harmony High
School orchestra.
Which graph best represents the same information?
A C
B   D

Number of
Members
Section
18 Strings
16 Brass
10 Woodwind
6 Percussion
Orchestra Members
Strings
Brass
Percussion
Orchestra Members
Woodwind
Orchestra Members
Strings
Brass
Percussion
Woodwind
Orchestra Members
Strings Woodwind
Brass
Percussion
Orchestra Members

Strings
Brass Woodwind
Percussion

7 Which expression is equal to
$5(2x$ $1 -$ $x -$ $4)$?
A $9x -$ 3
B $5x -$ 15
C $5x -$ 3
D $5x$ 25

6 Triangle PRS is similar to triangle TUV.
What is the length, in centimeters, of RS?
F 1.75 cm
G 2 cm
H 3 cm
J 3.5 cm

V
U
T 8 cm
7 cm
1 cm
S
R
P 4 cm

8 A storm brought more than 2 inches of snow to
4 different towns. The chart shows the
amount of snow each town received.
Which list shows the towns in order from the
greatest amount of snow received to the least
amount of snow received?
F Odem, Brackville, Cannon, Shelton
G Shelton, Odem, Brackville, Cannon
H Cannon, Brackville, Shelton, Odem
J Shelton, Cannon, Brackville, Odem

Town Number
of Inches
Brackville
Cannon
Odem
Shelton
Snow

2 5

8

2 7

10

2 1

2

2 3

4

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11 Reyna tossed a quarter and 2 dimes at the same time. The quarter landed heads up. What is the probability that both of the dimes also landed heads up?

A

B

C

D

14

13

12

23

10 A box contains 10 marbles. There are 4 red, 3 green, and 3 white marbles. Without looking, Jolene pulled 1 marble from the box, kept it, and then pulled another marble from the box. What is the probability that the first marble was white and the second marble was also white?

F

G

H

J

1

15

3

10

17

13

9 How many square centimeters of construction paper does Jessica need in order to exactly cover, with no overlap, 5 sides of a cube with edges that are 12 centimeters long?

A 60 cm2
B 144 cm2
C 300 cm2
D 720 cm2

13 Leslie wants to enlarge a photograph to make
a poster. The photograph has a width of
4 inches and a length of 6 inches. If the poster
is to be 30 inches wide, how long will it be?
A 20 in.
B 32 in.
C 40 in.
D 45 in.

12 Corinne is folding together an open-topped cardboard box using this net.
What is the surface area of the outside of the box?
F 47 m 2
G 54 m 2
H 73.5 m 2
J 90.5 m 2

3 meters
4 meters
4 meters
4.5 meters
4.5 m
3 m
4 m
14 Mr. Barnes needed to paint a rectangular wall
that was 125 feet long and 6 feet tall. When he
stopped to rest, he still had 100 square feet of
wall unpainted. How many square feet of wall
did he paint before he stopped to rest?
F 150 ft 2
G 162 ft 2
H 650 ft 2
J 750 ft 2

18 The graph shows 2 lines.
Which best represents the point of
intersection of these 2 lines?
F (0, 0)

G (4, −5)
H (−4, 6)
J (−6, 8)

y
x
−5
−4
−6
−7
−8
−9
−3
−2
−1
0
1
2
3
4
5
6
7
8
9
−1 1 −2 −3 −4 −5 −6 −7 −8 −9 2 3 4 5 6 7 8 9

17 A survey of 500 television viewers was conducted to find the number who watched a particular weekly program. Of these people, 250 indicated that they had seen the program at least once. If the survey is expanded to 2400 similar viewers, which is the best prediction of the number of people who have seen the show at least once?

A 720
B 1200
C 2150
D 4800

16 If *x*   *y* 3, which expression is equal to *y* 6 ?
F *x* 2
G *x* 3
H *x* 9
J *x* 18

15 A factory manufactured 30,000 tennis balls in 2 weeks. Out of every 1000 tennis balls produced, 15 were defective. Which proportion can be used to find the number of tennis balls, *t*, that were judged to be defective in the 2 weeks?

A

B

C

D

15
1000
1000 − 15
1000
t
30,000
15
1000
30,000
t
1000
30,000
t
15
t
30,000

20 Mrs. Kim purchased 4 jackets for her children. Which lists the prices in order from least to greatest?

F $62.90, $62.37, $63.05, $63.12
G $63.12, $63.05, $62.90, $62.37
H $63.05, $63.12, $62.37, $62.90
J $62.37, $62.90, $63.05, $63.12

19 The solid figure is built with cubes. Which could represent the shape of the solid figure when viewed from directly above?

A

B

C

D

25 Silver has a density of 655 pounds per cubic foot. Cypress wood has a density of 35 pounds per cubic foot. Which equation can be used to find *w*, the volume of cypress wood that has the same weight as 2 cubic feet of silver?

A 2*w*   655(35)
B *w*   655(2)   35
C 655*w*   35(2)
D *w*   655(35)(2)
E   35*w*   655(2)

24 The tables below correspond to 2 lines in the coordinate plane.
What is the *y*-coordinate at the point of intersection of the 2 lines?

F 0
G −1
H −2
J −3
K −4

x	*y*
−4	
−3	
−2	
−1	−4
−1	
−2	
−3	
0	

Line 1

x	*y*
−4	
−3	
−2	
−1	
−9	
−6	
−3	

Line 2

23 Unleaded gasoline costs $1.19 per gallon. Ms. Jefferson bought 8.141 gallons of unleaded gasoline. Which is the best estimate

of the total cost of Ms. Jefferson's purchase?
A $5
B $6
C $10
D $16
E $20

9
10
22 The total cost of a bouquet of roses at a flower
shop depends on the number of roses ordered.
The vase costs $5, and each rose costs $2.25.
Which equation can be used to find c, the total
cost of a bouquet with r roses?
F c (5   2.25)r
G c 5r 2.25
H c 5   2.25r
J c 5   (5 − 2.25)r
K Not Here

21 A soap-opera actor is paid $687 per episode.
He appeared in 208 episodes last year. Which
is the best estimate of his salary last year?
A $120,000
B $140,000
C $200,000
D $210,000
E $300,000

**Please note that items 21−60 have five answer
choices.**
Page 33
26 The emergency-room staff at a hospital sees more patients on Friday and
Saturday nights than on
other nights. The following graph shows the average number of patients
seen by the emergency-room
staff on each night of the week for the past year.
Which is the best estimate of the average number of patients seen per night
from Sunday
through Thursday?
F 60
G 70
H 80
J 90

K 110

Day
Number
of
Patients
Sunday Tuesday Thursday Saturday Monday Wednesday Friday
0
20
40
60
80
100
120
Average Number of Patients per Night
Page 34

29 Ray's Electrical Company charges $25 for a
service call, plus $15 per hour for labor after
the first hour. Materials for the job are
additional. The cost to the customer, C, is
found by the formula

C 25   15(h − 1) m

where h is the total number of hours required
for the job and m is the cost of materials.
What is the cost of the materials if the total
cost of a job is $91 and takes 3 hours?
A $21
B $36
C $49
D $146
E $161

27 The circle graph shows the source of funds for
the county government budget.
Which is the best estimate of the amount of
money collected from property taxes if the
total county budget is $3,782,900?
A $2,800,000
B $2,100,000
C $600,000
D $320,000
E $280,000

State tax

rebates
8%
Federal
grants
7%
Miscellaneous
fees
15%
Property
taxes
70%
County Budget Sources

28 A community swimming pool is 2 times as
long as it is wide. There are 6 swimming lanes
running the length of the pool. Each lane is
6 feet wide. What is the length of the pool?

F 30 ft
G 36 ft
H 51 ft
J 90 ft
K Not Here

6 ft
12

Page 35

31 The 5 state forests in Texas cover a total area
of 7200 acres. The graph shows the
approximate number of acres in each forest.
What percent of the state forests' area is
contained in Fairchild State Forest?

A 27%
B 33 %
C 37 %
D 60%
E 62 %

Fairchild
(27)
Jones
(17)
Kirby
(6)
Masterson
(5)

118

Siecke

(17)

Area of State Forests

(hundreds of acres)

13

12

12

30 Kelly's goal for a grade in her geometry class is 85 or better. The grade will be determined by the average of 4 tests. The average of her first 3 tests is 82. Which equation could Kelly use to find m, the minimum score she needs on her fourth test to get a grade of 85?

F $\dfrac{82 + m}{4} = 85$

G $\dfrac{4(82) + m}{4} = 85$

H $\dfrac{3(82) + m}{4} = 85$

J $\dfrac{3(82) + m}{3} = 85$

K $\dfrac{3(82) - m}{4} = 85$

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33 To pass an amendment to the Constitution, at least of the members of the legislature must vote in favor of the amendment. Which inequality describes v, the number of votes required to pass an amendment if there are m members of the legislature?

A $m \geq \dfrac{}{} v$

B $v \geq \dfrac{}{} m$

C $m \leq \dfrac{}{} v$

D $v \leq \dfrac{}{} m$

E $m \leq \dfrac{}{} v$

13

23

23
23
23
23
32 A bar of soap was in the shape of a
rectangular prism. The bar had a volume of
18 cubic inches. Arthur used it until it
measured 2 inches by 2 inches by 1 inch.
How much soap did he use?
F 2 in. 3
G 5 in. 3
H 8 in. 3
J 12 in. 3
K 14 in. 3

34
34
34
12
12
14
Page 37
34 Which set of data is represented by the line shown on the graph?
F
G
H

y
x
−5
−4
−6
−7
−8
−9
−3
−2
−1
0
1
2
3
4
5

6
7
8
9
−1 1 −2 −3 −4 −5 −6 −7 −8 −9 2 3 4 5 6 7 8 9
−4
−2
−8
−6
−4
−2
0
2
4 0

x y
−4
−2
−4
−2
0
2
0
2
4 4

x y
−4
−2
0
2
4
6
0
2
4 8

x y
−4
−2
1
3
5
7
0
2
4 9

x y
−4
−2
−5
−3
−1
1
0
2
4 3
x y
J
K

37 The chart shows the height of several mountains.

Which statement is **not** supported by the data?

A The highest mountains in the United States are found in Alaska.

B The highest mountain is about 2200 feet taller than the next highest.

C There are 13 U.S. mountains with heights between 14,494 feet and 16,550 feet.

D The first 17 tallest mountains in the United States are located in Alaska.

E All the mountains in the list are over 2 miles high.

Height of U.S. Mountains

Mountain	Height	Rank
McKinley (Alaska)	20,230 feet	1
St. Elias (Alaska)	18,008 feet	2
Foraker (Alaska)	17,400 feet	3
Bona (Alaska)	16,550 feet	4
Whitney (California)	14,494 feet	18
Elbert (Colorado)	14,433 feet	19

36 Gloria has a set of wooden blocks that are shaped like rectangular prisms. Each block is 6 centimeters long, 4 centimeters wide, and

2 centimeters high. How many of these blocks would be needed in order to fill a box that is 18 centimeters long, 16 centimeters wide, and 10 centimeters high?

F 32
G 48
H 56
J 60
K Not Here

35 Mr. Santos has a pentagonal garden with the dimensions shown in the diagram.
What is the perimeter of the garden?

A 17 yd
B 22 yd
C 27 yd
D 32 yd
E Not Here

4 yards
3 yards
10 yards
Page 39

40 The graph shows the gasoline efficiency of several cars.
Which statement is supported by the data?

F Car 1 can travel only half the distance of Car 4 on the same amount of gas.
G The median value for efficiency of all the cars is 30 miles per gallon.
H All the cars meet the federal guideline for fuel efficiency of at least 21 miles per gallon.
J Each car can travel a minimum of 350 miles on a tank of gas.
K The difference in gas mileage between the most efficient car and the least efficient car is more than 15 miles per gallon.

Car
Number
of
Miles

per
Gallon
1 2 3 4 5
0
10
20
30
40
50
Gasoline Efficiency

39 Which equation represents the line that contains the points (−2, 1) and (0, −3)?

A $y = -2x + 3$

B $y = -2x - 1$

C $y = -2x - 3$

D $y = x + 3$

E $y = x - 3$

38 In a political survey 50 students were asked if they considered themselves Democrat, Republican, or Independent. The graph shows the results.
According to the information in the graph, which is the best prediction of the number of students out of the 2500 at Walker High School who would consider themselves Independent?

F 750

G 850

H 900

J 1100

K 1700

Political Survey
Democrat
34%
Independent
36%
Republican
30%
Page 40

41 The video camcorders at Phil's Electronics Store range in price from $529 to $699. During a special rebate promotion,

124

14 camcorders were sold in 1 week.
Which is a reasonable total amount paid
by customers for these camcorders, not
including tax?
A Less than $4000
B Between $4000 and $6500
C Between $6500 and $10,000
D Between $10,000 and $13,500
E More than $13,500

43 Carol is an experienced curtain maker. She
charges $15 per hour plus the cost of material
to make curtains. For 1 set of curtains, Carol
purchased 10 yards of material at a price of
$8.99 per yard. Which equation can be used to
find C, the total cost of the set of curtains
before tax, if Carol spends t hours making the
curtains?
A C
B C 15(8.99)   10t
C C 15t 10(8.99)
D C 15t
E C 10t(15   8.99)

8.99
10
(15)(10)(8.99)
t

42 The maximum payload in pounds, P, of a
space shuttle is determined by the formula
P 14,200 −   180C − F
where C is the number of people in the crew
and F is the weight of the fuel needed to
maintain an orbit around Earth. What is the
maximum payload if the shuttle has a crew of
5 and requires 2600 pounds of fuel to
maintain orbit?
F 1200 lb
G 9795 lb
H 10,700 lb
J 11,420 lb
K 11,600 lb

44 Mr. Lee types documents for businesses and

research papers for students. He can finish from 12 to 15 pages per hour. He charges $0.75 per page or part of a page. Which is a reasonable amount that he could earn working at this rate for 40 hours during the week?

F More than $450

G Between $360 and $450

H Between $230 and $350

J Between $110 and $220

K Less than $110

Page 41

50 The cost for materials and installation of a new tile floor is $1.16 per square foot. Jan's kitchen has a floor area of 130 square feet. How much should the new tile floor for her kitchen cost before tax?

F $46.40

G $131.16

H $140.80

J $150.80

K Not Here

49 At −53 minutes in the countdown for a space shuttle launch, technicians began a 9-minute check of 1 of the shuttle's systems. How many minutes were in the countdown at the end of this check?

A −62 min

B −56 min

C −46 min

D −44 min

E Not Here

48 The total cost of lunch for 16 members of the French club was $124.80. What was the average cost per member?

F $4.05

G $7.08

H $7.20

J $8.17

K Not Here

47 An elementary school cafeteria sold 164 cartons of milk during a lunch period. If each carton cost $0.35, how much did the cafeteria collect from the sale of milk during that lunch period?

A $43.20
B $46.90
C $47.40
D $57.40
E Not Here

46 Billy placed 5.3 grams of salt in a cup of warm water. Then he poured off the water and found that 2.67 grams of the salt had not dissolved. How many grams of salt had dissolved in the water?

F 3.73 g
G 3.37 g
H 2.77 g
J 2.63 g
K Not Here

45 Ernie bought 2 pounds of bananas for a total of $1.19, a quart of ice cream for $2.85, chocolate sauce for $2.29, and a can of whipped cream for $1.38. How much did Ernie pay for his purchase?

A $6.33
B $6.41
C $7.73
D $9.71
E Not Here

Page 42
54 Elton had 4 entries on his spreadsheet. What is the sum of these entries?

F $239.59
G $151.89
H $136.05
J $116.01
K Not Here

Amount
($)

177.80
43.85
16.00
1.94

53 An empty dump truck weighed 3 tons. When the truck was fully loaded, it weighed 5 tons. What was the weight of the truck's load?

A 1 tons
B 2 tons
C 2 tons
D 2 tons
E Not Here

13
34
16
23
5
12
5
12

52 Joe went on a 3-hour bike ride. He rode 6 miles the first hour, 5 miles the second hour, and 4 miles the third hour. What was Joe's total mileage during his 3-hour bike ride?

F 15 mi
G 15 mi
H 16 mi
J 17 mi
K Not Here

14
45
7
20
25
7
20
3
10
3
10

51 Paula bought a 12-ounce can of coffee. She used 1 ounces of the coffee for each pot of coffee she made. If Paula used the whole can of coffee, how many pots did she make?

A 6

B 8

C 18

D 24

E Not Here

12

60 Karl waited tables part-time at a restaurant. In the 3 nights he worked last week, he received tips of $47.50, $42.75, and $38.00. How much did Karl make in tips those 3 nights?

F $127.25

G $128.25

H $131.25

J $137.25

K Not Here

59 When Marlon got his new puppy, it weighed 9.9 kilograms. After 1 month the puppy weighed 16.3 kilograms. How much did the puppy gain in 1 month?

A 7.4 kg

B 7.6 kg

C 13.6 kg

D 26.2 kg

E Not Here

58 Mike bought 3 bags of fertilizer for his lawn, which measures 2100 square feet. A bag of fertilizer costs $16.97, including tax, and covers about 750 square feet. How much did he spend for the fertilizer?

F $50.91

G $48.71

H $22.63

J $22.50

K Not Here

57 An hourglass contains 750 grams of sand. If

all the sand spills down at a constant rate in
60 minutes, how many grams of sand spill
down in 1 minute?
A 0.08 g
B 12.5 g
C 13.5 g
D 18.4 g
E Not Here

56 Linda bought 52 boards to replace part of her
fence. If each board was 4 feet long, what
was the total length of the boards that Linda
bought for her fence?
F 234 ft
G 229 ft
H 182 ft
J 156 ft
K Not Here

12
55 Rebecca paid $10.15 to place an advertisement
in a local newspaper. If each word cost $0.35,
how many words were in Rebecca's
advertisement?
A 29
B 31
C 39
D 65
E Not Here

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BE SURE YOU HAVE RECORDED ALL OF YOUR ANSWERS
ON THE ANSWER DOCUMENT.
Page 44
Page 45
READING
Page 46
Page 47
SAMPLE G
A tingle of excitement ran through Elizabeth's
body as she saddled her horse. At last she was old
enough to enter her favorite event. Whoever was
fastest would win.
As she daydreamed of accepting the first-place

ribbon, a familiar voice interrupted her. "Are you ready for the rodeo?"

She didn't have to look up. The voice came from Karen Collins, her toughest competitor. "Yes," she replied, "and may the best rider win."

SG-1 You can tell from the passage that a tingle is something that you —

A hear

B say

C feel

D think

SG-2 The winner of Elizabeth's event will be the contestant with the best —

F costume

G speed

H idea

J friends

DIRECTIONS

Read each passage. Then read each question that follows the passage. Decide which is the best answer to each question. Mark the letter for that answer.

Rodeo Rider

Page 48

Benito Juárez: Hero of the Americas

In the early nineteenth century, a young man was born into poverty but still managed to obtain an education. Compassionate and honest, he was compelled to fight his country's injustices and ultimately rose to become president. Although many might assume this describes Abraham Lincoln, those of Mexican heritage would cry out the name Benito Juárez!

The Early Years

Benito Juárez was born in a southern state of Mexico called Oaxaca. As a Zapotec Indian, he was a member of a group in Mexican society that was considered less important than others by the Spanish ruling class. Orphaned by age three, Juárez went to live with his grandfather and then with an uncle. Although his uncle taught Juárez all that he could, Juárez longed for a formal education. At the age of 12, Juárez went to the city of Oaxaca to live with his sister, who worked for a wealthy Italian family. The family arranged for Juárez to

receive an education, and he earned a law degree in 1831.

Entering Politics

After becoming a lawyer, Juárez entered politics. Between 1831 and 1846, he was elected to Oaxaca's city council, the Oaxaca state legislature, and then the national legislature. After serving only one year in the national legislature, Juárez was appointed governor for the state of Oaxaca. He again served as Oaxaca's governor after being elected to the position in 1848. As governor, Juárez worked for the betterment of the people and helped Oaxaca to become a prosperous state. Juárez established a public health system and built roads, bridges, and numerous schools. His greatest achievement, however, was reforming the state's government. Juárez carefully monitored tax collection, eliminated wasteful spending, and dismissed dishonest government employees.

National Prominence

After being ruled by Spain for about 300 years, Mexico had won its freedom in 1821. However, early independence was chaotic. Civil conflict had nearly bankrupted the treasury. The government had changed hands several times, but none of the rulers had addressed Mexico's political, economic, and social problems. As the people became disillusioned, two political parties developed. The Liberals favored equal distribution of land and equal treatment for all under the law. The Conservatives supported the historical leadership of the army and the wealthy landowners. Juárez, whose sympathies were with the people, sided with the Liberals.

In 1852 Juárez completed his term as governor of Oaxaca and returned to practicing law. Although Oaxaca's prosperity and stability continued as a result of his reforms, the chaos on the national level increased. By 1853 the Conservative leaders gained control of Mexico's national government. To secure their position, they sought to rid themselves of Liberal opponents. Juárez was falsely arrested and exiled from Mexico. Eventually making his way to New

Orleans, Juárez joined other exiles there. When the time was right, they returned to Mexico and declared their rebellion against the Conservative government.

Shaping Mexico

The rebellion succeeded, and the Liberals took control of the government, with Juárez serving as president of the supreme court. Government reform peaked with the Constitution of 1857, which proclaimed equal rights and equal justice for all citizens. The Conservatives countered, seizing control in Mexico City and setting up their own government there. Forced to flee Mexico City, Juárez still held the Liberal government together and became its president. For a time Mexico had two presidents, but public support was with Juárez. He was officially elected president of Mexico in 1861.

Over the years Mexico had borrowed heavily from other countries. To help the economy recover, Juárez temporarily stopped payment of its foreign debt. Although England and Spain eventually accepted Mexico's decision, France sent troops to Mexico to seize the country. On May 5, 1862, Juárez and his soldiers defeated a superior French force at Puebla, delaying the French occupation of Mexico City. This victory is celebrated today as *Cinco de Mayo*. The French finally prevailed, however, and captured Mexico City. Once again Juárez established a provisional government. Juárez and his forces finally defeated the French in 1867, bringing an end to foreign rule in Mexico.

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Born into a society inhospitable to his Zapotec heritage, Benito Juárez nonetheless became one of Mexico's most respected leaders. In difficult times rife with turmoil, poverty, war, and oppression, his courage and love for his country were unwavering. For this reason the people of Mexico have given him the well-deserved title Hero of the Americas.

7 Information in the passage suggests that Juárez —

A spoke several languages

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B was popular with the voters
C served more terms than any other president
D wrote the Constitution of 1857 without help

1 The reader can tell that equal distribution of land —
A had been attempted soon after independence
B was supported by a majority of Conservatives
C had nearly forced the country into bankruptcy
D would give most people more than they had previously had

8 Juárez was not in the top level of Mexico's society because he —
F did not begin school until age 12
G was a Zapotec Indian
H was unsuccessful as a lawyer
J was exiled from Mexico

3 Juárez was exiled from Mexico in 1853 because the —
A Liberals were planning to declare a rebellion when the time was right
B Conservatives wanted Oaxaca's stability and prosperity to continue
C Liberals dismissed dishonest government employees
D Conservatives wanted to ensure their control of the government

6 The next-to-last paragraph is mostly about —
F public support of Juárez
G the amount of Mexico's foreign debt
H countries that accepted Mexico's decision
J the conflict between Mexico and France

5 Which of these is the best summary of the passage?
A While serving as the governor for the

state of Oaxaca, Benito Juárez established a public health system and built roads, bridges, and schools.

B Overcoming hardships to gain an education, Benito Juárez worked for the betterment of the people during difficult times and eventually became president of Mexico.

C Benito Juárez was born a Zapotec Indian and, consequently, was considered less important by the Spanish ruling class before Mexico finally gained independence from Spain in 1821.

D After his exile Benito Juárez and others led a rebellion that succeeded, and the Liberals took control of the government, with Juárez serving as the president of the supreme court.

4 The author probably wrote this passage to —
F persuade political leaders to avoid civil wars
G describe the history and accomplishments of a great leader
H show the differences between Liberals and Conservatives
J explain the heritage of the Zapotec Indians

2 Which of these is an OPINION in the passage?
F Juárez's title as a hero is well deserved.
G Juárez treated other people fairly.
H Juárez was elected to Oaxaca's city council.
J Juárez was married in 1853.

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Lightning Above the Clouds
Two scientists from the United States have been traveling to countries such as Peru and Ecuador in South America to engage in some thrilling and frightening research. The scientists are studying lightning storms, which are

particularly intense in these areas. Rather than observing the lightning from the ground, scientists are watching the lightning from airplanes that fly at high altitudes above the surface of Earth. The dazzling phenomena — which have been given the fanciful names of "red sprites," "blue jets," and "elves" — occur high in the atmosphere above the clouds.

Red Sprites, Blue Jets, and Elves

During some storms a sudden flash of light will suffuse the upper atmosphere with a red glow that can extend as far as 60 miles above Earth. Known as a sprite because of its airy quality, this form of lightning expands across the sky often in the shape of a huge jellyfish, carrot, or turnip. Observers have reported seeing sprites that have red "heads" stretching toward the upper atmosphere and "arms" of purple light extending downward toward Earth. Red sprites are not considered rare events and usually appear in clusters of two or more.

Accompanying the red sprites in some storms is another mysterious and rarer form of lightning known as a blue jet. Blue jets are flashes of blue light that emanate from the top of thunderstorms and then flare upward as much as 20 miles above Earth. These trumpet-shaped jets of light can increase in size at speeds near 60 miles per second. Elves are the most recently discovered type of high-altitude lightning. These doughnut-shaped flashes take place 40 to 60 miles above Earth and are approximately 200 miles in diameter. Elves often appear just before sprites and are much brighter than sprites. Because they occur too fast to be seen with the naked eye, they can be detected only by instruments.

Discovery of the New Lightning

Although stories of strange forms of lightning have been around since the last century, scientists have taken them seriously only in recent years. In 1989 a scientist practicing night photography took pictures of two plumes of light rising from a thundercloud. This discovery, followed by other similar findings in pictures of thunderstorms taken

from space shuttles, spurred the initial scientific interest in upper-atmosphere lightning. In 1993 a team of scientists used a plane to follow a thunderstorm and captured 19 of these flashes of lightning on black-and-white videotape. Then in 1994 an Alaskan team of scientists recorded sprites and jets in color for the first time. The images of sprites and jets resembled red and blue fireworks.

Search for an Explanation

Today scientists have many photographs of lightning above the clouds. Although they do not have a definite explanation for the phenomena, they are making some progress. For instance, one popular theory is that the glow seen from the red sprites and blue jets results from the collision of electrically charged particles with nitrogen molecules in Earth's atmosphere. The collision causes molecules to glow blue in the stratosphere, or lower altitudes. These same molecules glow red in the mesosphere, a layer of the atmosphere above the stratosphere, and they can extend to an altitude of about 50 miles. This is the same process that causes the red color in the aurora borealis, or northern lights, over the Northern Hemisphere. In this case, electrically charged particles from the sun collide with air molecules in the upper atmosphere. Elves seem to be caused when forceful lightning hits the ground and sends electrically charged particles into the higher altitudes.

Scientists have many questions about red sprites, blue jets, and elves. Researchers are trying to determine whether the electrical charges in the atmosphere caused by these types of lightning interfere with space exploration, satellites, or high-altitude air travel. They are also studying other factors that could be affected, such as the formation of storms, global weather, and the protective ozone layer. Although they have different opinions about these types of lightning, scientists do agree that they are a spectacular sight to behold.

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12 Elves can be detected only by instruments

because they —
F occur too fast to be seen with the naked eye
G happen 40 to 60 miles above Earth
H occur in clusters of two or more
J stretch toward the upper atmosphere with red "heads"

11 Which of these is the best summary of this passage?
A The electrical charges produced by red sprites, blue jets, and elves may affect high-altitude air travel and space exploration.
B Modern scientists are conducting research to understand and determine the causes of red sprites, blue jets, and elves.
C Scientists have observed red sprites, blue jets, and elves from airplanes over Ecuador and Peru.
D Blue jets, which occasionally accompany red sprites, are jets of light that flare upward as much as 20 miles above Earth.

16 What is the main idea of this passage?
F Colorful flashes of lightning can be seen from Earth during thunderstorms.
G Scientists are studying ways in which lightning can interfere with satellites.
H Three newly identified forms of lightning that occur above the clouds are being studied.
J Scientists frequently travel to various areas around the world to study lightning.

9 In this passage, the word recorded means —
A stored
B indicated
C wrote
D photographed

14 The passage provides enough evidence to show that the scientists are —
F prosperous

G discouraged
H envious
J fascinated

13 One theory about red sprites and blue jets is that their glow is caused by —
A electrically charged particles in the atmosphere colliding with nitrogen molecules
B light that is reflected off satellites and planes flying at high altitudes
C forceful lightning hitting the ground and sending electrically charged particles upward
D electrons speeding up as a result of electrical charges

10 The author's purpose in writing this passage was probably to —
F entertain readers with stories about scientific adventures
G persuade readers to stay indoors during lightning storms
H inform readers about a mysterious natural phenomenon
J convince readers to observe lightning with telescopes

15 Which of these is an OPINION in this passage?
A Research is being conducted to find out why red sprites form.
B Lightning above the clouds is a spectacular sight to behold.
C Several hundred red sprites may appear in one thunderstorm.
D The flashes of lightning look like giant electric sparks.

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The First Woman Doctor
Unlike many people in the 1800s, Elizabeth Blackwell's parents believed in an equal education for their daughters and sons. All the Blackwell

children were educated by tutors at home and were encouraged to be independent. This gave Elizabeth Blackwell the courage to become a doctor, something that had never been accomplished by a woman in the United States. Intelligent and strong-willed, she was determined to achieve this milestone.

A Different Idea

When Blackwell was 24 years old, she took care of a family friend who had fallen ill. The friend suggested that Blackwell become a doctor. Blackwell had never thought about studying medicine and was initially reluctant to consider the idea. After thinking it over, however, Blackwell decided that becoming a doctor was worthwhile. She accepted the challenge with alacrity, excited at the prospect of going to medical school.

Blackwell applied to medical schools in Philadelphia and New York. Most schools did not think she was serious, nor did they have confidence in her ability. Consequently, they gave no credence to her applications. After 28 schools rejected her, the Geneva Medical School of Western New York accepted her as a student only because it was assumed that a rival medical school had submitted her application as a joke. Blackwell ultimately graduated at the top of her class, becoming the first female doctor in the United States.

A New Kind of Medical Care

Later, while studying in a hospital in England, Blackwell met Florence Nightingale. Nightingale was a nursing pioneer, and Blackwell was impressed with her practice of controlling illness through cleanliness. Blackwell returned to New York to set up her medical practice and began writing and lecturing on the need for good nutrition and sanitation to fight disease. Because of these efforts, Blackwell is thought to have been far ahead of her time. Doctors did not know then, as they do today, that many illnesses are caused by unsanitary conditions.

Blackwell also wanted to treat patients who could not afford health care. In 1857 she opened the New York Infirmary for Women and Children,

offering medical care to indigent patients. Focusing on the need for sanitation, she established a position at the hospital called a sanitary visitor. This position was the forerunner of the modern social worker. Sanitary visitors went to people's homes to discuss cleanliness and disease prevention. The hospital was a great success and treated many patients, but Blackwell still had other goals to accomplish.

More Achievements

In 1858 Blackwell returned to England for further study. A year later she became the first woman to be named to the British Medical Register, a listing of British doctors. Later she returned to New York, where she established the Women's Medical College of the New York Infirmary in 1868. Like many of Blackwell's undertakings, the college was ahead of its time. It required students to take an entrance exam, practice working with patients, and submit to a three-year course of study. Other medical schools at that time required as little as ten months of training.

An Inspiration to Others

Blackwell's achievements attracted other accomplished women to work with her. One of the first African American doctors was Rebecca Cole, who started out as a sanitary visitor for Blackwell. Blackwell's younger sister Emily was inspired to become a doctor as well and worked with Blackwell at the New York Infirmary.

Through her dedication and determination, Elizabeth Blackwell achieved many of her goals. In 1869 she moved to England and established a practice in London from which she eventually retired. Today at Hobart and William Smith College in Geneva, New York, formerly the Geneva Medical School from which she graduated, a beautiful bronze statue honors Elizabeth Blackwell, a medical pioneer who influenced others to pursue their dreams.

23 Which of these is the best summary of the

passage?

A In 1859 Elizabeth Blackwell was named to the British Medical Register, a listing of British doctors.

B Elizabeth Blackwell not only became the first woman doctor in the United States but also founded her own hospital and medical school.

C Elizabeth Blackwell's achievements attracted other accomplished women to work with her.

D In recognition of Elizabeth Blackwell's accomplishments as a doctor, Hobart and William Smith College erected a beautiful bronze statue.

17 Evidence in the passage suggests that —
A all people could afford proper health care
B little was known in the 1800s about the necessity of sanitary medical practices
C few medical schools were available from which to choose
D travel between England and the United States was prohibited during the 1800s

21 Elizabeth Blackwell's achievements are even more noteworthy because she —
A traveled to England to study and was accepted as a physician there
B studied with Florence Nightingale and learned about sanitary medical practices
C is considered a pioneer in an era when many obstacles blocked women from the field of medicine
D inspired her younger sister Emily to become a doctor and work at the New York Infirmary

19 What is the main idea of the section of the passage titled "A New Kind of Medical Care"?
A Blackwell was impressed by Nightingale's sanitary practices and used these ideas in her own hospital.
B Blackwell wrote and lectured on the need

for good nutrition and sanitation to fight disease.

C Blackwell established a position for a sanitary visitor, who went into people's homes to discuss cleanliness.

D Blackwell studied in a hospital in England, where she met Florence Nightingale.

18 Based on information in the passage, the reader can conclude that in Blackwell's time —

F most girls did not receive the same educational opportunities as boys did

G a great rivalry existed between medical schools in different countries

H most children were educated at home by tutors

J the Geneva Medical School was among the largest in the United States

22 Which of these best describes Elizabeth Blackwell?

F Forgetful

G Persistent

H Humorous

J Quarrelsome

20 The position of sanitary visitor was the forerunner to the position of the —

F British doctor

G modern social worker

H medical pioneer

J recovering patient

24 Which of these did Blackwell do first?

F Began writing and lecturing about sanitation

G Established the Women's Medical College

H Attended the Geneva Medical School

J Opened the New York Infirmary

Page 54
The Umbrella

"Just sign here, sir," the deliveryman said as he handed Oscar Reyna a package. Oscar scribbled his signature on the form, thanked the man, and then slipped back inside with his mysterious package in hand.

The package consisted of a long, narrow cardboard box carefully wrapped in brown paper. Opening the box, Oscar saw an umbrella inside — not just any umbrella, but an ornate, antique one with a beautifully carved wooden handle. Although he had not seen it in more than 20 years, he recognized it immediately.

Oscar recalled the evening when he had first seen the unusual umbrella. He was 16 years old then and had gone to a concert with his grandparents. As they were leaving, he noticed an umbrella on one of the empty seats. Intrigued by its beauty, Oscar felt compelled to find its owner. Oscar and his grandparents went to the box office and asked if there were a lost and found. The manager pulled out an overstuffed box containing at least a dozen other umbrellas, none of which was likely to be reunited with its owner. Inquiring if there were a way to determine a person's name from a seat number, Oscar convinced the manager to look in the record of advance ticket sales. Just as he thought, a name matched the seat where Oscar had found the umbrella. The name was Mrs. Katie O'Brien.

Oscar talked his grandparents into going by Mrs. O'Brien's house on their way home. It was in one of the prettiest parts of town on a street with huge magnolia trees and vast lawns. They found the house and pulled into the driveway. Oscar's grandparents offered to go up to the door with him, but he wanted to handle the matter himself. Oscar walked up the steps to the front door. As he rang the bell, he heard the chimes pealing and the barking of a small dog. Then the door opened, and an elderly woman appeared in the doorway. She was tall and dressed in a tailored suit. Her graying hair was drawn up tightly on her head.

"May I help you?" she asked.

"I found this umbrella at the concert tonight,"
said Oscar hesitantly. "I'd like to return it if it's
yours," he added, holding out the umbrella as if
presenting a gift that had long been wished for.
"Why, yes! It's mine," replied Mrs. O'Brien
with a wide smile and sparkling eyes. "It was given
to me by my father years ago. Thank you so much
for returning it. May I offer you a reward for your
kindness?"
"No, ma'am," he assured her. "My
grandmother says that a good deed is its own
reward."
"Well, how about that. That's exactly what my
father used to say. What is your name, young
man?"
Years later Oscar was staring at the
elaborately carved handle of the umbrella as he
remembered Mrs. O'Brien. He gently removed the
umbrella from its protective tissue paper. It was in
perfect condition, considering how old it was. Why
had it arrived here today?
As if in answer, a note fell from the tissue
paper. It read:
Mrs. O'Brien wanted you to accept
this umbrella as recompense for a kind,
unselfish gesture long ago. She said
that you would understand.
Oscar smiled as he ran his fingers along the
umbrella's carved handle. Then he rearranged
several items on the shelf of the hall closet and set
it down gingerly, so as not to scratch the carved
handle. It would remain there until he changed his
clothes later that evening and put the concert
tickets in his pocket. He already cherished his
newly acquired possession.

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29 Oscar decided not to leave the umbrella in the
lost-and-found box because —
A   he thought it would not be reunited with
its owner
B his grandparents suggested that he return
the umbrella personally
C there was no room in the overstuffed box

D he was anxious to meet the person who owned the umbrella

27 What is the best summary of this passage?
A A man remembers attending a concert with his grandparents when he was 16 years old.
B When he receives a mysterious package, a man remembers finding an umbrella at a concert years earlier and returning it to its owner.
C A boy is able to convince his grandparents and the manager of the concert hall to help him return a lost umbrella to its owner.
D A boy returns an umbrella to a woman and declines her offer of a reward.

26 Which of the following happened last?
F A deliveryman gave Oscar a package that contained the umbrella.
G Oscar returned the umbrella to Mrs. O'Brien after she had forgotten it.
H The manager found a name that matched the seat where the umbrella was found.
J Oscar and his grandparents asked if there were a lost and found.

31 In this passage, the word recompense means —
A an apology
B payment
C an explanation
D satisfaction

30 Oscar can best be described as —
F shy
G creative
H ambitious
J thoughtful

28 What will Oscar probably do with the umbrella?
F Give it to someone as a gift

G Put it back in the box and store it in the closet
H Take it to the concert that evening
J Send it back to Mrs. O'Brien

32 Which of these is an OPINION in this passage?
F The package Oscar received was mysterious.
G Mrs. O'Brien's house was less than one mile from Oscar's neighborhood.
H Oscar recognized the umbrella immediately.
J Oscar deserved a reward for taking the time to return Mrs. O'Brien's umbrella.

25 Which of these is a FACT in this passage?
A Most people would not have bothered to return the umbrella.
B Mrs. O'Brien lived in one of the prettiest parts of town.
C When Oscar rang the bell, he heard the barking of a small dog.
D The umbrella had been in Mrs. O'Brien's family for generations.

Page 56
Should Olga buy the book?
Olga had always enjoyed the charactercentered books written by Adele Kwan and wanted to read another one if it seemed interesting and was written in the same style. Olga wasn't sure, however, whether she should spend part of her savings on Kwan's latest book, *The Newcomer*. She hoped the following book reviews in her high school newspaper would help her make a decision.

I just finished reading Adele Kwan's latest novel, The Newcomer, and was disappointed. In my opinion the book does not have enough plot to be considered a novel.
The newcomer in this book is Violet Wang. She's fifteen when her family moves from San Francisco's Chinatown to a small town in Washington State. In this town

everyone knows each other, and none of the other residents are Chinese. Violet's challenge is to fit in. Sensitive and intelligent, she amuses those who know her well but is shy and reserved with strangers.

These circumstances could have provided the basis for an interesting story. I particularly enjoyed learning about Chinese American culture and Violet's strong family ties. However, this book has no real plot. There is no action to follow. Instead the author emphasizes what is happening in Violet's head as she finds her way in her new home. We are introduced to new characters and situations only as they are viewed by the introspective Violet. When she arrives at her new school, for example, the reader is forced to endure page after page describing Violet's classrooms, classmates, and teachers, with no excitement to keep us involved in the story.

If this had been a historical novel, at least the text could have elucidated what life was like during a past era. If it had been a mystery, I would have had a reason to move from one page to the next. Furthermore, Violet would have had a more intriguing way to demonstrate her intelligence and sensitivity.

As it is, I found The Newcomer uninteresting. The lack of plot and the reliance on a single character to support the entire book make for a dull, slow-moving reading experience. Although Ms. Kwan writes well, she has failed to present a story worth reading.

In last week's edition I read "Novel Without a Plot," an unflattering review of Adele Kwan's latest novel. I, too, have read The Newcomer, and I strongly disagree with Carlo Dante's evaluation of this fine novel.

Dante claims The Newcomer lacks a plot. He fails to recognize that some novels are plot-driven and others are character-centered. Clearly Dante prefers to read the former and feels justified in imposing his preference on all of us. There are many readers who do not require a story to propel us feverishly from one action-packed moment to the next. We are content to get to know an interesting character who encounters challenges and tries various ways to overcome them. Violet Wang is a wonderful example of this type of character, and we are fortunate that the novel is told from her point of view. We first experience her world in

San Francisco, where she is surrounded by Chinese American traditions and the support of an extended family. We feel her confusion and traumatic sense of loss as she must leave all that is familiar to her. When Violet arrives in the area that will be her new home, we see its beauty and mystery through her eyes. As she tries to adjust to life in a place where she feels like an outsider, many of us may remember similar times in our own lives. We ache when she hurts and feel triumph in our hearts when she experiences progress.

I won't tell you why Violet has had to make such a drastic life change or how she comes to terms with it. Unlike Dante, I think that most readers would greatly enjoy this book. In these times of action-adventure movies and computer games, many have lost the patience to be readers, thinkers, and emotional beings. I think that someone who fails to see the value in this book is missing out on a lot.

Novel Without a Plot
by Carlo Dante

A Book to Cherish
by Rachel Blythe
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38 Which conclusion is best supported by information in the passage?

F Rachel Blythe and Olga have similar reading tastes.

G Adele Kwan is a best-selling author.

H Rachel Blythe does not read novels that are plot-driven.

J Violet has become more outspoken since her move.

36 In this passage, the word introspective means having —

F wrong information

G extra energy

H inner thoughts

J no interest

37 Based on information in the reviews, with which statement would both Carlo Dante and Rachel Blythe probably agree?

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A *The Newcomer* is an action-adventure story.
B Violet is outgoing, even around strangers.
C *The Newcomer* is a powerful and captivating book.
D   Violet has a strong bond with family members.

35 Which of these is the best summary of the passage?
A Voicing his disappointment in Adele Kwan's latest novel, Carlo Dante writes a book review criticizing the book as uninteresting and lacking in plot.
B   To help her decide whether to purchase Adele Kwan's new book, *The Newcomer*, Olga reads opposing book reviews in her high school newspaper.
C As a supporter of character-centered novels, Rachel Blythe writes a book review defending Adele Kwan's *The Newcomer* because she feels many people will enjoy the book.
D Olga enjoys the character-centered books of Adele Kwan and would like to read another one if it is interesting and is written in the same style.

34 When Olga read Rachel Blythe's review, she probably felt —
F   encouraged
G indifferent
H confused
J depressed

33 Based on information in his review, the reader can conclude that Carlo Dante —
A reads many historical novels
B enjoys only action-adventure movies
C   prefers a plot-driven novel
D writes frequently for the newspaper

40 In this passage, the word traumatic means extremely —

F deliberate
G protective
H fascinating
J disturbing

39 Based on information in the passage, the reader can conclude Violet's primary source of conflict stems from her —
A not being fluent in Chinese
B difficulties with her schoolwork
C parents being extremely strict
D family's move to Washington State

Page 58
Community Service Benefits Everyone
"Let's hurry," Stan said to Rogelio as they walked out of their last class. "My dad is waiting outside to give us a ride to the senior center." Rogelio and Stan were members of the Central High School Community Service Club. They had both joined because they liked the idea of giving something back to their community through service. They had been looking forward to the club's visit to the senior center for weeks.

"I don't think I can go," Rogelio said.

"Yeah, right!" Stan replied, laughing. But then he realized that the serious look on Rogelio's face meant that he was not being facetious.

"Tomorrow is our biology test on human anatomy, and I have to make a good grade. I don't know how I'll ever become a doctor if I can't even remember the names of the major bones in the human body."

"But you have to go. You're the one who suggested to the club members that we visit the senior center," Stan reminded Rogelio.

Rogelio thought about how he always waved to the men and women as he walked past the senior center. He often wanted to talk to them to hear the interesting stories they had to tell.

"I think your club members will like volunteering here," Mrs. Ellington, the center's activities director, had told Rogelio when he had called to arrange their visit. "You'll be surprised to

find that elderly people are interested in many of the same things young people are."

"Service," Stan reminded him. "That's what our club is all about. And you made a commitment to be there."

"Yeah, I guess you're right," said Rogelio, gathering his books. "But I'm not looking forward to filling in that diagram of the skeletal system on the test tomorrow."

When they arrived at the center, Mrs. Ellington showed the club members through the facility. She was introducing Stan to a woman who enjoyed playing chess when Rogelio noticed a man reading intently in a chair by the window. Rogelio was surprised to see that the man was reading a medical journal.

"You're interested in medicine, too?" Rogelio asked.

The man looked up. "I am, indeed," he answered, adjusting his glasses to get a better look at Rogelio. "I was a physician with my own practice before I retired."

"You're kidding!" Rogelio exclaimed, pulling up a chair. "Then you know all about the human skeletal system."

"Why, yes," the man said, laughing, "from the top of the cranium to the tips of the phalanges. From head to toe, the way the human body is constructed is fascinating."

"Rogelio Mendoza, I'd like you to meet Dr. Avery Sutton," said Mrs. Ellington, coming up behind them. But the two were already deep in conversation.

"How did you ever learn all the names of the bones in the body?" Rogelio asked.

"Remember the old 'Bones' song from grade school? The shinbone's connected to the knee bone. . . . ," Dr. Sutton sang. "Well, I used that song as a mnemonic device to help me through my introductory anatomy course. To learn the anatomical names of the bones and their locations, I simply substituted the anatomical terms for the common names. The clavicle's connected to the sternum." Before long, Rogelio and Dr. Sutton had

sung their way through the ribs and the vertebrae.

"It's time for us to go," Stan said to Rogelio two hours later. "My dad will be picking us up in a few minutes."

"I wish I could stay longer," Rogelio said, shaking Dr. Sutton's hand. "I really enjoyed the visit."

"Come back soon," said Dr. Sutton, smiling.

As they climbed into the car, Stan said, "Wow, Mrs. Hernández is a fabulous chess player! She beat me four games out of seven. I wish we could have played one more game, but you must be glad to be getting home to study."

Stan's comment elicited a smile from Rogelio. "Not really," he said mysteriously. Then he turned toward the window and began to sing softly, "The clavicle's connected to the sternum. . . ."

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44 Which of these is an OPINION in the passage?

F Chess is the best game for building analytical skills.

G Mrs. Hernández is a fabulous chess player.

H Central High School has a chess club for students.

J Mrs. Hernández beat Stan four games out of seven.

43 In this passage, Rogelio's conflict is between his commitments to —

A the senior center and his parents

B Mrs. Ellington and Avery Sutton

C the Community Service Club and Stan

D his schoolwork and community service

42 Rogelio goes to the senior center because he feels —

F obligated

G suspicious

H flattered

J nervous

41 Before he retired, Avery Sutton was —
A a professional singer
B a physician
C a biology teacher
D an activities director

46 Based on information in the passage, the reader can conclude that —
F Rogelio and Stan always rode to school together
G Mrs. Ellington had not been in her position long
H Stan was an enthusiastic chess player
J Avery Sutton had many visitors at the senior center

45 Which of these will most likely happen in the future?
A Rogelio will visit Avery Sutton at the senior center.
B Stan will play checkers with Mrs. Hernández.
C Mrs. Ellington will teach at Central High School.
D Avery Sutton will go back to work in his office.

48 After Rogelio's visit at the senior center, how does he feel about his biology test?
F Indifferent
G Perplexed
H Confident
J Amused

47 Which of these is a FACT in the passage?
A Medical students should take more anatomy courses.
B Avery Sutton retired more than ten years ago.
C The way the human body is constructed is fascinating.
D The clavicle is connected to the sternum.

APPENDIX C

TAAS OBJECTIVES

TAAS Objectives

Domain : Concepts
Objective 1: The student will demonstrate an understanding of number concepts

 Use Scientific notation
  Round whole numbers and decimals
 Compare and order real (rational) numbers
  Determine relationships between and among fractions, decimals, and percents
  Find squares and square roots

Objective 2: The student will demonstrate an understanding of mathematical relations, functions, and other algebraic concepts.

  Recognize and use rational number properties and inverse operations
   Determine missing elements in patterns
   Identify ordered pairs and solution sets in one and two dimensions
   Apply ratio and proportion
  Use exponents and properties of exponents
  Evaluate variables and expressions (formulas)
   Solve simple equations involving integers, decimals, and fractions

Objective 3: The student will demonstrate and understanding of geometric properties and relationships.

   Use the basic elements of geometry (point, line, segment, ray, angle)
   Use geometric figures and their characteristics
   Use right-triangle properties
   Use indirect measurement with similar triangles
   Apply geometric properties

Objective 4: The student will demonstrate and understanding of measurement concepts using metric and customary units

   Use metric and customary units
   Solve problems involving measures
   Find distance, perimeter, circumference, area, surface area, and volume
   Recognize precision

Objective 5: The student will demonstrate an understanding of probability and statistics.

Use the counting procedure
Find the probability of simple and compound events
Determine the mean, the median, and the mode

Domain: Operations

Objective 6: The student will use the operation of addition to solve problems

Use the operation of addition with real numbers in practical situations

Objective 7: The student will use the operation of subtraction to solve problems

Use the operation of addition with real numbers in practical situations

Objective 8: The student will use the operation of multiplication to solve problems.

Use the operation of addition with real numbers in practical situations

Objective 9: The student will use the operation of division to solve problems.

Use the operation of addition with real numbers in practical situations

Domain: Problem Solving

Objective 10: The student will estimate solutions to a problem situation

Estimate solutions

Objective 11: The student will determine solution strategies and will analyze or solve problems

Identify strategies for solving or solve proportion problems
Determine methods for finding or find percent and percentage
Determine methods for or solve measurement problems
Formulate or solve problems using geometric concepts
Analyze or solve probability and statistics problems
Make predictions

Objective 12: The student will express or solve problems using mathematical representation

Formulate equations inequalities
Analyze or interpret graphs, charts, tables, maps, or diagrams and use the information derived to solve problems

Objective 13: The student will evaluate the reasonableness of a solution to a problem situation

Determine the validity of conclusions drawn from statistical data
Evaluates reasonableness

<div align="center">Reading</div>

Domain: Reading Comprehension

Objective 1: The student will determine the meaning of words in a variety of written texts
   Use context clues to choose the appropriate meaning of multiple-meaning words
   Use knowledge of the meanings of prefixes and suffixes to determine word meanings
   Use context clues (e.g., synonym, antonym, definition and explanation, description, or example) to determine the meanings of unfamiliar words
   Use context clues to determine the meanings of specialized/technical terms

Objective 2: The student will identify supporting ideas in a variety of written texts.

   Recognize facts and details
   Arrange details/events in sequential order
   Follow complex written directions

Objective 3: The student will summarize a variety of written texts

   Identify the stated or paraphrased main idea of a selection
   Identify the implied main idea of a selection
   Identify the best summary of a selection

Objective 4: The student will perceive relationships and recognize outcomes in a variety of written text.

 Perceive cause and effect relationships

 Predict probable future actions and outcomes

Objective 5: The student will analyze information in a variety of written texts in order to make inferences and generalizations

Interpret diagrams, graphs, and statistical illustrations
Make inferences and draw conclusion
Make generalizations
Evaluate and make judgments
Describe plot, setting, character, and mood in literary selections

Objective 6: The student will recognize points of view, propaganda, and/or statements of fact and non-fact in a variety of written texts.

Recognize the author's point of view and purpose
Recognize forms of propaganda and persuasive language
Distinguish between fact and non-fact
Use the composing process to plan and generate writing that accomplishes a specified purpose
Inform an audience using information and ideas from a variety of source
Persuade an audience by presenting logical reasons
Use formal and informal language appropriately

APPENDIX D

CATE PERFORMANCE AND PERCEPTION SURVEY

Informed Consent for CATE Performance and Perception Survey

The purpose of this survey is to collect information to use in a doctoral study. The study will examine the relationship between CATE programs and student performance on state tests. The current research supports CATE as a model of best practices and suggests that participation in CATE relates to higher scores on state tests.

The CATE survey can be completed in 15 minutes or less and involves no foreseeable risks. You give consent by completing the survey. Participation is voluntary and you may stop at any time.

Individual responses will not be reported to anyone. The data will be reported in aggregate. If you have any questions regarding this survey or study, please contact Charlotte Mooneyham at (940) 565 3710, (940) 300 4548, or Cmooneyham@coe.unt.edu University of North Texas Department of Technology and Cognition or Jeff Allen at (940) 565 4918 or jAllen@coe.unt.edu University of North Texas Department of Technology and Cognition.

This project has been reviewed and approved by the University of North Texas Institutional Review Board (940) 565 3940. You may keep this Informed Consent Notice for your records.

CATE Performance and Perception Survey

The following survey will be used in a study that relates participation in CATE to performance on the Academic Excellence Indicator System. Please respond by selecting a ranking. The anticipated time for completion is estimated to be less than 15 minutes.

Please enter your district number.

Part I: CATE Program Effectiveness

A. Effectiveness

Perceived CATE Effectiveness (PCE)

Excellent   (EX)
Good   (GD)
Average   (AV)
Poor   (PR)
Not Present (NP)

		EX	GD	AV	PR	NP
1.	Rank the effectiveness of your district CATE Program.	☐	☐	☐	☐	☐
2.	Rank the degree of previous positive change in your district CATE Program.	☐	☐	☐	☐	☐
3.	Rank the degree of current academic integration into your district CATE Program.	☐	☐	☐	☐	☐
4.	Rank the need for further academic integration into CATE Programs in your district.	☐	☐	☐	☐	☐
5.	Rank the degree that further positive change is needed in your district CATE Program.	☐	☐	☐	☐	☐

Part II: CATE Program Performance

B. Instruction

Exceeds   (EX)
Somewhat Exceeds   (SE)
Meets Standards   (MS)
Below Standards   (BS)
Does Not Exist   (NE)

	EX	SE	SD	BS	NE

6.   Rank the degree that instruction is competency based.

☐   ☐   ☐   ☐   ☐

7.   Rank the degree that instruction is based on TEKS.

☐   ☐ < td>   ☐   ☐   ☐

8.   Rank the degree that district teachers have professional certification in addition to teaching credentials.

☐   ☐   ☐   ☐   ☐

9.   Rank the degree that students participate in program planning and evaluation.

☐   ☐   ☐   ☐   ☐

C. Advisory Committees

10.   Rank the degree that advisory committees exist in your district.

☐   ☐   ☐   ☐   ☐

11.   Rank that advisory committees are active in your district.

☐   ☐   ☐   ☐   ☐

12.   Rank the degree that advisory committees are composed of business and industry representatives.

☐   ☐   ☐   ☐   ☐

13.   Rank the degree that local advisory committees participate in annual reviews and updates of instructional objectives to ensure relevance to current business/industry practices and program needs.

☐   ☐   ☐   ☐   ☐

D. Student Enrollment and Continuing Education and Training

14. Rank the degree that student organizations exist for all areas of CATE in your district.

   ☐   ☐   ☐   ☐   ☐

15. Rank the degree that student organizations are active for all areas of CATE in your district.

   ☐   ☐   ☐   ☐   ☐

16. Rank the levels of student organization involvement from local chapter to state, regional, national, and international in your district.

   ☐   ☐   ☐   ☐   ☐

17. Rank the degree that your district has CATE programs that lead to receiving professional- level license and/or certifications in CATE fields.

   ☐   ☐   ☐   ☐   ☐

18. Rank the degree that your district encourages students to pursue postsecondary education or training.

   ☐   ☐   ☐   ☐   ☐

19. Rank the degree that CATE enrollment is increasing in your district.

   ☐   ☐   ☐   ☐   ☐

20. Rank the degree that CATE enrollment represents represents district population groups.

   ☐   ☐   ☐   ☐   ☐

Please add additional comments that would help to describe CATE in your district.
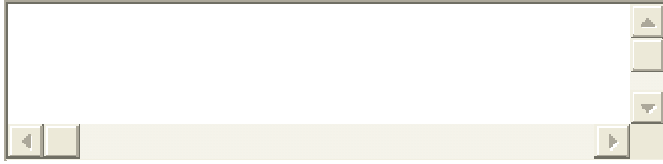
Thank you for sharing your time and experience. If you would like a copy of the completed study, check below.

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