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# The Effects of Program Model and Language on Science TAKS Scores Among Fifth Graders

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THE EFFECTS OF PROGRAM MODEL AND LANGUAGE ON SCIENCE  
TAKS SCORES AMONG FIFTH GRADERS

STEPHANIE ZELENAK

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Dean of the Graduate School

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2008

## DEDICATION

It is with a gracious and loving heart that I dedicate this work to my family. Only they know the challenges of this effort.

David, the love of my life, supported and counseled me, making possible the completion of this degree. I appreciate his efforts to ease my load in so many ways. I could not have done this without him.

Our children, Erica, Tristan and Logan have inspired me and as I have many times taught them never to quit—I so continued in this endeavor. My dreams for them and all children will always guide my work.

Finally, I dedicate my dissertation to my mother, who was tremendously encouraging of my pursuing every goal I ever could imagine for myself, and who passed away before seeing this dream accomplished.

THE EFFECTS OF PROGRAM MODEL AND LANGUAGE ON SCIENCE  
TAKS SCORES AMONG FIFTH GRADERS

By

STEPHANIE ZELENAK, B.A., M.Ed.

DISSERTATION

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# THE UNIVERSITY OF TEXAS AT EL PASO

## ABSTRACT

### THE EFFECTS OF PROGRAM MODEL AND LANGUAGE ON SCIENCE TAKS SCORES AMONG FIFTH GRADERS

This study examined the conditions of learning allowing students in one classroom to succeed on the fifth grade science TAKS test whereas students in other classrooms on the same campus do not succeed. It focused on the relationship of program models, specifically as it pertains to the influence of language within the content area of science and student performance on the fifth grade science TAKS scores.

To compare the academic achievement, as measured by the Texas Assessment of Knowledge and Skills (TAKS) test, in grade five students as a function of program model, the mean levels of achievement of students served by straight monolingual, 50/50 TWB (Spanish component of dual), 50/50 TWM (English component of dual) and 90/10 OWB programs were examined. The mean levels of achievement of students on the fifth grade science TAKS were also compared as a function of language of instruction and the language in which the test was administered to the students. The mean levels of achievement of students were also compared as a function of various teacher characteristics. An analysis of variance (ANOVA) was the statistical procedure used in this study.

The findings of this study revealed that a statistically significant difference was present in TAKS science scores as a function of Program Model. Students in a Two-Way (dual) program model outperformed the students in the One-Way model. No

significant differences were found in the mean scores of students as a function of teachers' area of certification, teachers' source of certification, teachers' first language, teachers' language of formal education, or teacher/student language match. In the analysis of teacher characteristics, students taught by teachers educated in the U.S. in grades K-12 significantly outscored the students taught by teachers educated in Mexico in grades K-12. Students taught by teachers with a master's degree significantly outscored students taught by teachers without a master's degree. The students taught by teachers with less than two years of experience were significantly outscored by the students taught by teachers with more than two years of experience.

Of the students who passed the grade 5 science TAKS test in the 2007-2008 school year, 87% shared a match between their test language and the teacher's language of formal education. Of the students who did not pass, 44% did not share a match between their test language and the teacher's language of formal education. A statistically significant difference was found to be present in TAKS science scores as a function of Language of Instruction. Students who were instructed in English-only scored significantly higher on the grade five science TAKS test than did students who were instructed in English and Spanish. A statistically significant difference was present in TAKS science scores as a function of test language. Students who took the grade five science TAKS test in English scored significantly higher than students who took the test in Spanish.

To determine the availability of instructional materials and resources provided to WTSD teachers in English and Spanish, teachers' responses were analyzed from the teacher survey. Survey responses revealed that there is availability to instructional

materials in both English and Spanish with the exception of science content literature, which is not reported to be available in Spanish. Other materials have some availability in Spanish but not to the same degree as that which is available in English.

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## Chapter 1

### INTRODUCTION

#### Background

With the emergence of standards-based reform, there are increased demands in Texas to ensure success for all students, as defined by passing the TAKS tests, leading to high-stakes accountability systems for school, teacher, and pupil performance. As expectations rise for students and teachers to perform at higher levels, the question of how best to support this becomes even more critical. However, the extent to which placement into a particular program model and language affect student performance is not well understood.

Multicultural, bilingual, and standards-based educational theories constitute reform initiatives that seek to equalize quality instruction and subsequent learning opportunities for traditionally marginalized student populations (i.e. linguistic and ethnic minorities). However, given the struggles students, especially minority students, continue to face in their attainment of success in school, it is imperative to gain a better understanding of fifth grade classrooms and the ways in which they serve all students.

Students of classroom life often assume that failure in the classroom is directly related to the teacher and his or her interactions with students (Pacheco, 2008). However, there are situations that reveal unequal access to learning opportunities. For example, the researcher has discovered that students who are receiving science instruction in Spanish are not being provided equal instructional and testing materials. The existing literature brings attention to the equity issues in fifth grade science, but does not detail how the limited and lesser quality instructional materials and

questionable language issues of the science test and classroom instruction raise concerns of equity and subtractive bilingual programs. This study is an appraisal, a valuation that will challenge educators' core belief in equal opportunity, or a lack thereof. How unequal access to educational opportunity is produced and reproduced is a topic that needs further understanding.

### Statement of the Problem

Across the state, fifth graders are struggling with the science Texas Assessment of Knowledge and Skills (Texas Education Agency, 2007). Within the West Texas School District (WTSD) that is the focus of this study, students face the same challenges. Although it is not uncommon to find classrooms with a large percentage of passing scores, other classrooms on the same campus may quite perplexingly have very low passing rates. This disparity is discriminating because it assumes that poor performance outcomes for one segment of the population are appropriate and acceptable, while superior performance outcomes are appropriate and acceptable for others. "Even today, the concept of educational opportunity is not generally accepted. All children are equal, but some children are more equal than others" (Cardenas, 1997, p.2). This makes research that will advocate Texas school reform a necessity, not an option.

Based on the statistics found in Texas State Senator Elliott Shapleigh's *Texas on the Brink* (2007), it is unacceptable to ignore what the numbers say about where Texas ranks nationally. No longer can the assumption be made that any city within Texas boundaries is too small or exempt from the responsibility to the future. The statistics on how Texas ranks among the 50 states provides a meager outlook. In summary, Texas

is in the average range for public health and hospital spending, but ranks in the bottom 10% in all other areas including public education. Although Texas has the second highest public school enrollment and a high percentage of school funding comes from local revenues, outcomes are less than favorable. Texas ranks very low in teacher salaries, state aid, SAT scores, and graduation rates.

The high growth of birth rates and school-aged children in Texas requires an immense effort to improve conditions for children. This begins with devotion to effective public education. As described in Shapleigh's article (2007),

Let us not forget that the business of Texas is Texans. To 'Close the Gap' in Texas, we must graduate more of our best and brightest. If we invest in our greatest resource, Texas will be the state of the future. If we do not, family incomes will fall an average of \$6,000 by 2040. Texas is on the brink. The choice is ours. Let us resolve now to invest in young Texans today to guarantee the prosperity of all Texans tomorrow (p.1).

There is an established history for the need to work toward the common goal of achieving adequate attention and support for our nation's education system. In Texas specifically, it is of utmost importance to explore priority issues for the State Department of Education related to the implications of policy and legislation that are aimed to address issues of equity, efficiency, and outcomes in the state's K-12 education system. Systematic treatment of the initiative to address performance gaps between the majority population and the English Language Learner (ELL) and lower socioeconomic status (SES) population is crucial.

The model for the 2002 federal education plan was conceived in Senate Bill 7. The reauthorization of the Elementary and Secondary Education Act (and often catch phrased as No Child Left Behind), is the accountability system that measures and holds schools and districts accountable for student performance on assessment tests and dropout rates. Campuses and districts each year receive an accountability rating based on the percentage of all students and the four student groups (white, Hispanic, African American and economically disadvantaged) that pass the state's assessment tests at grades three through eleven. The rating also considers the overall student dropout rate and each individual student group (Texas Education Agency, 2007). All too often, measured performance falls short of expectations. Rapid and dramatic change calls for intensified efforts to help every student learn.

Texas students continue to be held to ever-increasing accountability standards through more rigorous curriculum and graduation requirements, and implementation of a new, tougher statewide assessment test, including the provision that third, fifth, and eighth-grade students must pass the test, along with their coursework, to be promoted. The stakes are indeed, high. As a result, public discourse regarding educational approaches becomes a political arena with a variety of stakeholders: the students, their parents, politicians, curricula and test vendors, and the community as a whole. Many voices are expressing viewpoints and claiming to have answers to enhance student achievement.

By looking closely at this problem, it is hopeful that a clearer understanding of the elements that produce, hinder, or impact learning and teaching the science curriculum in the context of TAKS will be gained. Student performance within all subgroups must

improve significantly if students are to meet challenging academic and workplace standards. Educational programs must be scrutinized, especially those that are primarily responsible for servicing the students in these subgroups, such as bilingual and special education. In this era, LEP children have been Left Behind. There is no question that education systems must be examined to understand the link between resource (teachers, instructional materials, etc) allocation and student performance.

### Theoretical and Conceptual Framework

This mixed methods study was born from a general area of interest on the part of the researcher to discover what, if any, relationship exists between language and fifth grade science TAKS scores. The framework included consideration of educational models and programs, language, public education standards; tests and accountability; political, social, ideological and economical influences on testing; and restricted linguistic code.

As a part of this study, the researcher examined, through a thorough review of the literature, the exogenous and independent variables as they are related to the dependent variable. Figure 1, the analytical model, presents the connection and flow of the specified exogenous variables and independent variables that influence the student outcomes on the Texas Assessment of Knowledge and Skills, which is the dependent variable. Figure 2, the measurement model, presents a detailed breakdown of the independent variables that informed the conjectures about the outcome of the dependent variable in this study.

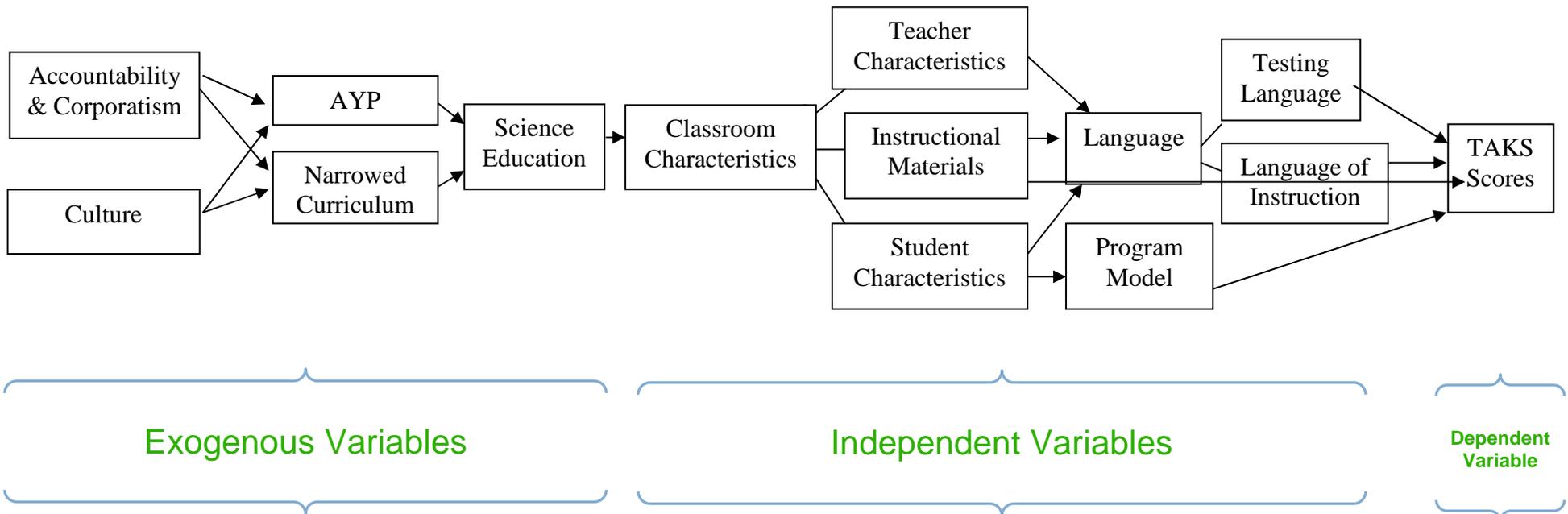


Figure 1: Analytical Model

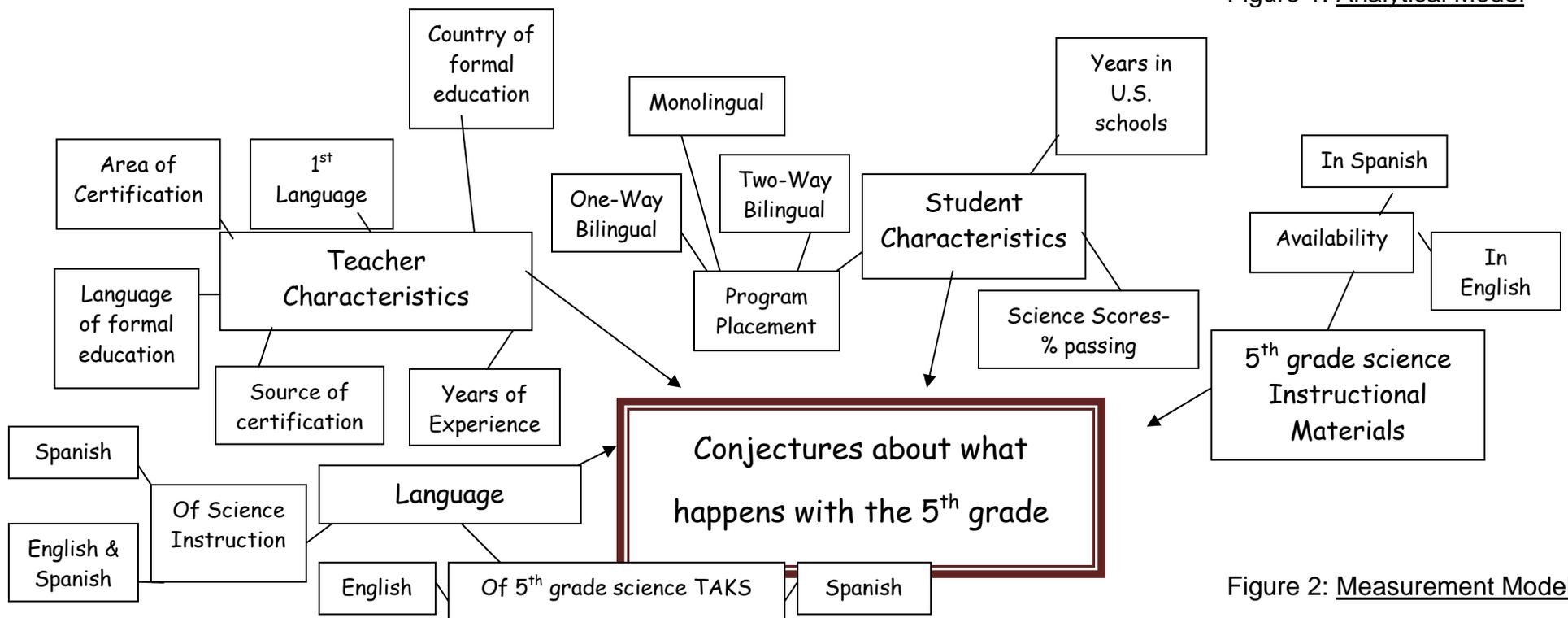


Figure 2: Measurement Model

Accountability and corporatism, culture, annual yearly progress (AYP), a narrowed curriculum, and science education are all exogenous variables shown in Figure 1 that establish the context and background for the organization of instruction. As described in the review of the literature, accountability and corporatism are closely tied and both impact a school's ability to meet AYP and therefore often result in the narrowing of a curriculum designed to produce passing test scores. Culture, as explained in that section of the literature review, also has the potential to influence AYP and lends itself to a greater possibility of a watered down curriculum. AYP and this narrowed curriculum then affect the quality and effectiveness of the science education provided to fifth grade students.

In Figure 2, the independent variables of this study are described. The teacher characteristics that were examined include the teachers' area(s) and source of certification, years of teaching experience, first language, and language and country of formal education. The student characteristics are language coding and proficiency, years of schooling in the United States, and program placement. Figure 2 shows that within the three program model options, there are monolingual, one-way bilingual, and two-way bilingual (dual language) classes. Classroom models dictate the uses of language. This facet was examined closely as a potential impact on science Instruction and testing outcomes. Possible correlations between these three classroom models and student achievement in science were appraised. Based on these placements, students receive instruction in English, Spanish, or both, and therefore require instructional materials in English, Spanish, or both. As shown in Figure 2, the instructional materials variable was examined on the basis of availability. The last independent variable

depicted in Figure 2 is language- language of the science instruction within each classroom, as well as the language of the science test used to assess the acquisition of *science* content. Within the system of education, it can be challenging to make causal statements because there are many factors influencing one outcome- student learning. However, it is impossible to deny that patterns in correlations point to perceptions and answers.

Specification of this analytical model was informed by Critical Race Theory (CRT). The case was presented of those who are marginalized, in this case English language learners, to highlight possible injustices. Racial separation has complex, historic, and socially constructed purposes that ensure power in groups considered superior to people of color. Racism consists of conscious and unconscious acts that assert dominance by allocating privileges “through hierarchical structures that govern all political, economic and social domains” (DeCuir & Dixon, 2004). The main tenets of CRT are that racism is an ordinary occurrence; the idea of interest convergence which affirms that rights are only given if they serve the majority; dominant realities often exist at the expense of others; and within education, processes are identified and transformed that maintain the marginal position of minority students (Delgado & Stefancic, 2001; DeCuir & Dixon, 2004; Ladson-Billings, 1998).

CRT is a theory and social movement that was developed from legal studies (Matsuda, Lawrence, Delgado, & Crenshaw, 1993) but cuts across disciplinary lines including education (Delgado & Stefancic, 2001). CRT "not only tries to understand our social situation, but to change it; it sets out not only to ascertain how society organizes

itself along racial lines and hierarchies, but to transform it for the better” (Delgado & Stefancic, 2001, p. 3).

Critical race theorists believe that the construction of race as a biological, singular truth serves the interests of White people (Delgado & Stefancic, 2001; Ladson-Billings, 1998). They argue that the benefits of this biological hierarchy of race extend across class and other differences. Racism provides material and psychic benefits to White people, both the economic elite and the working class, to such an extent that they are not compelled to work to end it (Delgado & Stefancic, 2001). For example, during a major school finance reform period designed to reduce the gaps between educational funding for the students in wealthy and poor school districts, professionalism was quickly and easily compromised on behalf of the preservation of the elitist system of education in Texas (Cardenas, 1997).

Through this study, factors that explain the persistence of race and class inequality may be identified. As defined by Albert Memmi (1971), “racism is the generalized and final assigning of values to real or imaginary differences, to the accuser’s benefit and at his victim’s expense, in order to justify the former’s own privileges or aggression” (p. 185). Although it may be unintended, education in its current state is a venue that acts as a reproductive mechanism for the sustaining of class and race rank, and positioning in society. As described by Cardenas (1997),

Regardless of the theoretical equality of our democracy, there has been and still is a deep feeling that some people are entitled to privileged positions-that some children should receive greater educational opportunity because of the social, economic, political or educational status of their parents (p. 2).

In an article by Yosso (2005), five tenets of CRT that can and should inform theory, research, pedagogy, curriculum, and policy are identified. Of these tenets, the one most applicable to this study's focus is the "challenge to dominant ideology" (p. 80). The other tenets are: "the intercentricity of race and racism; the commitment to social justice; the centrality of experiential knowledge; and the utilization of interdisciplinary approaches" (Yosso, 2005, p. 80). CRT challenges "White" privilege and argues that their traditional claims act as a camouflage for the self-interest, power, and privilege of dominant groups in American society (Yosso, 2005). Within this study, racism of this form is not assumed to apply only to "whites." However, in order to document and analyze the educational access and persistence of underrepresented students, the theoretical models whose popularity may have waned since the 1960s and 1970s, but whose commitment to speaking the truth about power, continues to address contemporary social realities.

Yosso (2005) noted that it has been over a century since DuBois predicted that racism would continue to emerge as one of the United States' key social problems. Racism overtly shaped social institutions in this country at the beginning of the twentieth century and continues to impact them now. The solution for effectively analyzing and challenging the impact of race and racism in U.S. society still eludes us. "Critical race theory (CRT) is a framework that can be used to theorize, examine and challenge the ways race and racism implicitly and explicitly impact social structures, practices and discourses" (Yosso, 2005, p.71).

Yosso (2005) defined CRT in education as a "theoretical and analytical framework that challenges the ways race and racism impact educational structures,

practices, and discourses. CRT is conceived as a social justice project that works toward the liberatory potential of schooling” (p. 84). This acknowledges the contradictory nature of education, wherein schools most often oppress and marginalize while they maintain the potential to emancipate and empower. Indeed, CRT refutes dominant ideology and privilege while validating and centering the experiences of the underrepresented.

### Purpose of the Study

The purpose of this research project was to develop an understanding of how local learning conditions may produce disparate outcomes among fifth graders on the science Texas Assessment of Knowledge and Skills (TAKS). In pursuing this, it is hopeful that the elements that produce, hinder and/or impact learning and teaching the science curriculum in the context of TAKS will materialize.

A large focus in research today was teacher quality, however, it was not the focus of this study. This study focused on the influence of language as it relates to the fifth grade science TAKS. There is little research in this area. Thus, in this study, inquiry revolved around the conditions of learning allowing students in one classroom to succeed on the fifth grade science TAKS while students in other classrooms on the same campus do not succeed.

This study was intended to help fill a gap in the current knowledge base and to contribute to reform efforts and instructional decision-making in the field of education regarding the relationship of placement into specific program models, specifically as it pertains to the influence of language within the content area of science, and student performance on the fifth grade science TAKS. Other past and current studies provide

some answers to these questions and more than a few hypotheses. Yet there remains a tremendous amount of work to be done. The extensive research agenda outlined in this report was developed because it identifies a large number of unanswered but pressing educational concerns.

### Significance of the Study

Through this project, the researcher was looking at how classroom characteristics and student learning are shaped and impacted, as defined by achievement on accountability measurements within the content area of science. A search to understand the social contexts, issues of equity and language, and the cultural dissonance that so many children face in the classrooms they inhabit was necessary. The astounding numbers of failures on the fifth grade science TAKS warrants conducting this study especially given the increased emphasis on accountability. If there are factors causing students to fail, then it is the responsibility of educational leaders to identify them and develop plausible solutions.

This study is also important because of the need to expand the existing body of knowledge on the effects of accountability and thus improve educational decision-making in the area of classroom practices based on student achievement on the fifth grade science TAKS. Hence, through this study the researcher sought to contribute to the literature on science education in culturally and linguistically diverse contexts and offer alternatives for designing and implementing initiatives to help teachers provide effective science instruction for all students. Additionally, this study was intended to shed light on the reality of current educational policies that often fail to provide equitable learning opportunities for all students especially ELLs.

## Research Questions

The following were the central guiding questions that provided a focus for this study:

- 1) What are the effects of program model (one-way bilingual, two-way bilingual, monolingual, or two-way monolingual) on science TAKS scores of fifth grade students?
- 2) What are the effects of teacher characteristics (area and source of certification, years of teaching experience, first language, and language and country of formal education) on science TAKS scores of fifth grade students?
- 3) What are the effects of the language of science instruction (English or English and Spanish) on science TAKS scores of fifth grade students?
- 4) What are the effects of the language of the test (English, Spanish) on science TAKS scores of fifth grade students?
- 5) What is the availability of instructional science materials provided to West Texas School District (WSTD) fifth grade students in English and Spanish?

## Definition of Terms

### Bilingual Education and Special Language Programs-Texas State Policy.

Section 29.051 of the Texas Education Code states that English is the basic language of this state. Public schools are responsible for providing a full opportunity for all students to become competent in speaking, reading, writing, and comprehending the English language. Large numbers of students in the state come from environments in which the primary language is other than English. Experience has shown that public

school classes in which instruction is given only in English are often inadequate for the education of those students. The mastery of basic English language skills is a prerequisite for effective participation in the state's educational program. Bilingual education and special language programs can meet the regular school curriculum. Therefore, in accordance with the policy of the state to ensure equal educational opportunity to every student, and in recognition of the educational needs of the establishment of bilingual education and special language programs in the public schools, the state provides supplemental financial assistance to help school districts meet the extra costs of the programs.

Bilingual Program Models. All bilingual program models use the students' home language, in addition to English, for instruction. These programs are most easily implemented in districts with a large number of students from the same language background. Students in bilingual programs are grouped according to their first language, and teachers must be proficient in both English and the students' home language.

Culturally and Linguistically Diverse (CLD). The broad population of individuals who come from homes in which the culture and language or dialect differ from the dominant language and culture of the society in which they reside.

Early-Exit Bilingual Program. A bilingual program designed to help children acquire the English skills required to succeed in an English-only mainstream classroom. These programs provide some initial instruction in the students' first language, primarily for the introduction of reading, but also for clarification. Instruction in the first language is phased out rapidly, with most students mainstreamed by the end of first or second

grade. The choice of an early-exit model may reflect community or parental preference, or it may be the only bilingual program option available in districts with a limited number of bilingual teachers. State law defines standards for exit from a bilingual program. Some students leave the bilingual program before meeting the standards. As a result, these students receive monolingual English instruction, possibly before they are prepared academically to face this challenge.

English Language Learner (ELL). As a subset of CLD students, ELLs are students who are in the process of acquiring English as an additional language. For the purposes of this paper, the term is preferred over “limited English proficient” (LEP) unless reference is being made to an official classification used by a school district or governmental or state agency.

Exited-LEPs. This term identifies students who were identified LEP, received bilingual education and exited by meeting state-mandated guidelines.

High Minority Public School. This term refers to a school having more than 50% of the student enrollment classified as non-White (U.S. Census Bureau, 2003).

Fifth Graders. This term describes students between the ages of 9 and 13 who were enrolled in the fifth and final year of elementary school during the 2007-2008 academic school year.

Home Language Survey (HLS). The state requires that parents complete the HLS at the time the student is enrolled in public schools. An HLS must be kept in the students’ cumulative folder at all times, as this is a state audit item. The survey asks two questions: “What language is spoken most of the time in your home?” and “What language does your child speak most of the time?” If the answer to either of these

questions is not English, a testing process begins to identify the level of English proficiency of the student.

Language Minority Students in the United States. Students typically living in households in which a language other than Standard English is spoken. Language minority students in need of language support services to succeed in English-medium classrooms are referred to as English language learners (ELLs) in this document. These students are the focus of this dissertation.

Language Proficiency Assessment Committee (LPAC). The LPAC reviews the progress of students enrolled in the bilingual program annually. When the student attains the exit standards, the LPAC may recommend that the student enter the English instructional program. The student's progress is then reviewed for two more years. If the student is not progressing satisfactorily, the LPAC may recommend that the student return to the bilingual instructional program. The LPAC also determines if the student will take the TAKS in English or Spanish in grades 3-5.

Late-Exit Bilingual Program. A program that differs from early-exit programs primarily in the amount and duration that English is used for instruction as well as the length of time students are to participate in each program. Students remain in late-exit programs throughout elementary school and continue to receive 40% or more of their instruction in their first language, even when they have been reclassified as fluent-English-proficient.

Limited-English-Proficient (LEP) students [now more commonly referred to as English Language Learners (ELLs)]. Students not having fluency in English, but whose native language skills in listening, speaking, reading, or writing are such that they derive

little benefit from school instruction in English are identified by this term. In the state of Texas, where this study takes place, the term LEP applies if one or more of the following criteria are met:

(1) the student's ability in English is so limited or the student is so handicapped that assessment procedures cannot be administered; (2) that student's score or relative degree of achievement on the agency-approved English proficiency test is below the levels established by the agency as indicative of reasonable proficiency; (3) the student's primary language proficiency score as measured by an agency-approved test is greater than his proficiency in English; or (4) the language proficiency assessment committee determines, based on other information such as (but not limited to) teacher evaluation, parental viewpoint or student viewpoint, that the student's primary language proficiency is greater than his proficiency in English or that the student is not reasonably proficient in English (Texas Education Code s21.455).

Low minority public school. This term refers to any school having less than 50% of the student enrollment classified as White/non-Hispanic (U.S. Census Bureau, 2001).

Monolingual. This term refers to a classroom model where all instruction and instructional materials are only in English in every grade and subject.

Native English Speaker (NES). An individual whose first and/or dominant language is English. In WTSD during the period of this study, English and Spanish proficiency was established through the Language Assessment Scales (LAS) as well as a home language survey (HLS).

Native Spanish Speaker (NSS). An individual whose first and/or dominant language is Spanish. In WTSD during the period of this study, English and Spanish proficiency was established through the Language Assessment Scales (LAS), Texas English Language Proficiency Assessment System (TELPAS) and the home language survey (HLS).

Never-LEPs. This term identifies students who have not received instruction in the bilingual program and have not been identified as limited in English proficiency.

No Child Left Behind Act (NCLB). This term refers to Public Law 107-110 passed by the 107 Congress of the United States, which is entitled, “An Act to close the achievement gap with accountability, flexibility, and choice, so that no child is left behind.”

Non-LEP. This term defines a student who is identified as proficient in English either as a result of the responses his parent provides on the Home Language Survey, or by demonstration through testing that English is the student’s dominant language. If the answers on the Home Language Survey are “English” to both questions, the student is identified as Non-LEP. If the responses are any language other than “English,” the student must be tested with the Pre IPT/ IPT 1 or the SLEP, depending on the grade of enrollment. If the student passes the examination, he is identified as Non-LEP.

One-Way Bilingual Education (OWBE). [also referred to as developmental or enriched bilingual education]. An additive approach to ELL education that promotes full bilingualism and biliteracy in English and the child’s native language. OWBE is defined by West Texas School District (WTSD) as:

an additive bilingual education program that provides all students with a variety of experiences in two languages and creates an environment that fosters academic excellence in two languages. It is supportive of full bilingual proficiency and biliteracy for non-native speakers of English. Extensive academic instruction is provided to English learners in the native language as well as in English. Unlike students in transitional bilingual education, those in a one-way program continue to receive part of their instruction in the native language even after they become proficient in English. Maintaining program integrity requires strict adherence to the following: (1) Context based curriculum is the Texas Essential Knowledge and Skills and WTSD Curriculum Benchmarks); (2) The languages are not mixed within a lesson and both languages are each used for instruction as indicated by the time and treatment policy; (3) The curriculum spirals because lessons are never repeated in the other language. Lessons build one on the other and teachers must remain true to the language of instruction. No code-switching is permitted by the teacher. This program model utilizes a 90/10 time and treatment. (WTSD Homepage, WTSD Program Guide, 2007).

Percent Passing. This term is defined as the percentage of students achieving a minimum scaled score of 2100, which is required to meet the minimum standards required by Texas Education Agency.

Program Placement. This term refers to one of the three program models offered by the district under study. This district offers 50/50 two-way bilingual (dual language),

straight monolingual, and 90/10 one-way bilingual classrooms in grades K-5. These three models of program placement within the fifth grade will be examined within this study.

Science TAKS. This term is defined as a standardized test used in Texas to assess student attainment of science skills required under Texas education standards and in compliance with No Child Left Behind.

Second Language Learner. A student who is acquiring a language in addition to his or her native language. This term includes both English learners and students who are learning languages other than English.

Senate Bill I. This term identifies Texas legislation establishing bilingual education and special language programs in public schools in order to ensure an “equal educational opportunity to every student, and in recognition of the educational needs of students of limited English proficiency.” It states that English is the “basic language of this state.”

Texas English Language Proficiency Assessment System (TELPAS). An assessment developed by the Texas Education Agency in order to meet the federal testing requirements of the No Child Left Behind Act of 2001 (NCLB). Under NCLB, Texas must assess English language learners annually in listening, speaking, reading, and writing. Students learning the English language begin participating in TELPAS in kindergarten and stop participating when their language proficiency assessment committee (LPAC) determines that they are proficient in the English language. For students in kindergarten through grade 2, TELPAS consists of the Texas Observation Protocols (TOP). TELPAS uses four proficiency ratings—Beginning, Intermediate,

Advanced, and Advanced High—to show the progress students make in learning English from year to year.

Transitional Bilingual Education (TBE). This term refers to a classroom program model where children immediately begin learning English based on an acquisition timeline that determines the percentage of instruction being provided in English and in Spanish. Instruction and instructional materials are in English and Spanish based on grade level and students' needs. Students are taught initially in Spanish in order to learn major concepts. Transition is gradual and English instructional time is increased as Spanish instructional time is decreased. These programs provide instruction in the native language as well as in English. However, once a child attains a certain level of English proficiency, he or she is exited into a monolingual English program. The early-exit transitional bilingual programs mainstream students after 2 years or by the end of the second grade. A late-exit transitional program delays exiting students until the fifth or sixth grade. Programs vary and may not always adhere to these guidelines.

Two-Way Bilingual Education (TWBE). This term refers to a classroom program model where instruction and instructional materials are offered and presented equally in English and Spanish. This 50/50 model is consistent across all subjects and grade levels. This program [also referred to as a dual language program – DLP, or two-way immersion – TWI or developmental bilingual education] is identical in design and goals to the OWBE except for 1) the population of students, which is made up of both native English speakers and native speakers of the target language (Spanish in this case) and 2) the time and treatment given to English and Spanish instruction. Speakers of both languages are placed together in a bilingual classroom to learn each other's language

and to work academically in both languages. In some programs, the languages are used on alternating days. Others may alternate morning and afternoon, or they may divide the use of the two languages by academic subject. Native English speakers and speakers of another language have the opportunity to acquire proficiency in a second language while continuing to develop their native language skills. Students serve as native-speaker role models for their peers. Two-way bilingual classes may be taught by a single teacher who is proficient in both languages or by two teachers, one of whom is bilingual. In a two-way program, the native English children become bilingual and biliterate alongside the English learners. TWBE is defined by West Texas School District (WTSD) as:

an additive bilingual education program that provides all students with a variety of experiences in two languages and creates an environment that fosters academic excellence in two languages. It is supportive of full bilingual proficiency and biliteracy for both native and non-native speakers of English. This model creates an additive environment because it promotes a positive attitude toward both cultures involved. Maintaining program integrity requires strict adherence to the following: (1) Context based curriculum is the Texas Essential Knowledge and Skills and WTSD Curriculum Benchmarks; (2) Class composition is balanced between English learners and native English speakers; (3) The languages are not mixed within a subject and both languages are each used for instruction in approximately equal proportions; (4) The curriculum spirals because lessons are never repeated in the other language. Lessons build one on the other and

teachers must remain true to the language of instruction. No code-switching is permitted by the teacher (WTSD Homepage, WTSD Program Guide, 2007).

Within this study, it is possible to identify two groups of students who are participating in the TWBE program. One group is native Spanish speakers. The other is native English speakers. For purposes of this study, we will refer to native Spanish speakers in the TWBE program as the Two-Way Bilingual (TWB) group. Native English speakers in the TWBE program will be referred to as the Two-Way Monolingual (TWM) group. Both groups of students are mixed within one TWBE class.

### Delimitations

This study was delimited to fifth graders in WTSD, only in the area of science, during the 2007-2008 academic school year. Theories about bilingual education exist, but that is not to say that one method or philosophy is the right method or philosophy for all situations despite varying learning conditions, fields of study, and circumstances. Therefore, the researcher elected to study only one tested content area because findings could vary in different content areas or in a study of a collection of content areas.

The only variables considered for effect on science TAKS scores were placement in a straight monolingual, one-way bilingual, or two-way bilingual (dual language) classroom; language of science instruction; the language of the fifth grade science Texas Assessment of Knowledge and Skills (TAKS); and, the availability of instructional science materials provided to WTSD fifth graders in English and Spanish.

## Limitations

- The ability to generalize findings from this study may be limited due to the use of a single school district with a particular set of demographics and in a particular geographic location.
- The potential that unidentified variables may influence the percent passing on the science TAKS among fifth graders in WTSD.
- Other limitations may include the availability of student cumulative folders, permission to access school district files, the necessity to keep student information confidential, and errors and/or missing data in TAKS history. Furthermore, reported scores do not reflect all students in the fifth grade and could therefore be higher or lower depending on the students who did not take the test or who took an alternative assessment.
- From the questionnaire administered to gain information about teacher characteristics, there is a possibility that participants may provide erroneous information.
- The *enacted* versus the *written* models may influence the percent passing on the science TAKS among fifth graders in the school district under study.
- There is variation between the Spanish and English science TEKS and TAKS.
- Because the science test has recently been included in the high-stakes testing program for fifth graders, there is the potential that since science has been neglected as compared to the other content areas in the lower elementary grades, test scores may be negatively affected.

- Finally, because the numbers of students in each program model in grade five are not exactly equal and because randomization (parent denials, recent immigrants, etc.) cannot be ensured, results may be affected.

### Chapter Summary

This chapter included the background of the study, statement of the problem, the theoretical and conceptual framework, and the purpose and significance of the study. Additionally, this chapter included the research questions guiding this study, definition of terms, delimitations and limitations.

### Organization of Remaining Chapters

This study is organized into five chapters. Chapter 2 will include a review of the following topics: culture and social capital, social and educational barriers limiting academic success of culturally diverse students, bilingual education, growth of language minority students and the achievement gap, the impacts of high-stakes testing, corporatism and privatization in the United States, and linguistic and cultural knowledge within science education. Critical Race Theory informs the analytical model of this study. Chapter 3 of this study describes the methodology used in this research; including a description of the participants, research design, and data analysis. Chapter 4 presents the results of the study based on the research questions posed in Chapter 1; and, Chapter 5 includes a summary of the study, conclusions, links to the extant literature, implications for practice, and recommendations for further research.

## Chapter 2

### REVIEW OF THE LITERATURE

In this chapter, the literature relevant to this study will be reviewed as well as tracing the history of bilingual education, the accountability movement, and corporatism and privatization in the United States.

#### Culture and Social Capital

There is difficulty and inherent complexity in attempting to define culture. One is not served well by adopting an essentialist perspective, claiming that one Hispanic or one Anglo is like all others, but throughout the literature and throughout everyday conversations, there are recognizable patterns, perspectives and tendencies that are more likely in one group of people versus another (Ericson, 1996; Swidler, 2003). Furthermore, the fact is that “culture,” practices and tendencies, are not rooted in race or ethnicity alone, but are also embedded in social-class and economic positioning. In fact, class has many times been proven to trump race and color, as found by Lareau (2003) and Orfield, et. al, (1996). Thus, in discussing culture, it must be acknowledged that there are many factors that influence the behaviors, the patterns, and essentially, the life experiences and styles of various groups of people. Nonetheless, the idea of culture is addressed in the first portion of the literature review, as the discussion illustrates the importance of one possessing the “right kind” of cultural capital when it comes to institutional interaction.

In addressing the debate over knowledge within the context of social inequality, Pierre Bourdieu argued that “the knowledges of the upper and middle classes are considered capital valuable to a hierarchical society. If one is not born into a family

whose knowledge is already deemed valuable, then one could access it and the potential for social mobility through formal schooling” (Yosso, 2005, p. 69). Pierre Bourdieu’s theoretical insight about how a hierarchical society reproduces itself has often been interpreted as a way to explain why the academic and social outcomes of People of Color are significantly lower than the outcomes of Whites. The assumption is that they lack the social and cultural capital required for social mobility. Social mobility requires the adoption of attitudes and behavior patterns that are different from or antithetical to their culture of origin -- requirements that make the path through school more problematic and perilous than it might be for a student who arrives equipped with the dominant forms of cultural capital.

Within a definition of culture one can find elements of opinion and societal roles. “Culture is reflected in the meanings people attach to various aspects of life; their way of looking at the world and their role in it; in their values... Culture... becomes crystallized in the institutions and tangible products of a society...” (Fowler, 2004, pp. 94-95). How various cultures are accepted and respected by the dominant institutional apparatus is critical to the mobility and success of each respective population.

Early researchers explored two elements of the hidden curriculum: blaming the victim and "cooling-out" (Hearn & Olzak, 1981; Ryan, 1976). Blaming the victim refers to social interactions that socialize students to define themselves as the problem, rather than exploring the structural causes for their experiences within the institution. This ideology requires students to see their experiences as unique and particularistic, rather than linked to the culture and social structure of education. "Cooling-out" refers to socialization messages that encourage students to lower their expectations and to

identify situations they once protested as "normal" and unchangeable (Young, 1974). Students who have been "cooled-out" can be redirected to appropriate tracks that reflect their social and economic backgrounds.

Blaming the victim and cooling-out functions offer significant insight into the reproduction of inequality in education. The hidden curriculum serves the cooling-out function by inculcating a certain detachment from racism and social injustice. This process of cooling-out often begins by defining unequal learning conditions as acceptable and matching one's expectations to those conditions- not expecting very much, not getting very much, and just accepting it as "that's the way it is." Examples of this include the tendency to find in many schools where bilingual programs exist, the unequal access to authentic Spanish materials and resources as compared to English materials and resources, and the teachers who are providing the Spanish instruction are far less likely to be native Spanish speakers than the English teachers being English native speakers. Another way of developing detachment from racism is to define the observation and naming of racism as a personal weakness -- that is, as being oversensitive to the issue. Acquiring "distance" implies becoming blind to the personal experience of inequality, as well as to larger social issues (Hearn & Olzak, 1981; Ryan, 1976).

Amidst the most successful social justice wave the U.S. has ever known, the Johnson Administration created the U.S. Commission on Civil Rights to address issues related to the socio-cultural competency of American public schools in regard to the growing Mexican-American minority. This was one of the primary studies on Hispanic-serving institutes. The Commission's duty was to study how issues like color, class, and

culture were impacting the Mexican-American student's public school experience. Through a mixed methods research approach, in which hundreds of southwestern public schools participated, the U.S. Commission on Civil Rights found evidence to indicate that the majority of school administrators and teachers, almost exclusively white, viewed themselves as racially and economically superior to the Mexican American population (U.S. Commission on Civil Rights Mexican American Education Study, Report I, 1971).

Bejarano's (2005) work, which was motivated by Valenzuela's research, outline the persistent tendency of school leaders to rely on a deficit framework and explains how the practice of stripping minority student's of their social and cultural wealth creates social and cultural divisions among the students as well as between students and staff. These divisions of course make minority students more susceptible to academic failure and "takes away from the education of these students, who recognize a schooling process that disrespects them and eventually leads to their academic demise" (p.19).

### Social and Educational Barriers Limiting Academic Success of Culturally Diverse Students

While from one to the other the interpretation and definition may differ, becoming an explanation, a travesty or an alibi, it always refers back to the same fact. Racism and discrimination may be more or less out in the open, or more or less disguised, but it is always discernible to the victims. In short, "racism is one of the most widespread attitudes in the world. Racism is a social fact" (Memmi, 1971, p.197). This in itself is enough to explain why it is so important, so varied, so extensive, so deep and so general. This also means that it often pre-exists, imposing itself on the individual. In

other words, before taking root in the individual, racism has taken root in the institutions and ideologies all around him, in the education he receives and the culture he acquires.

A critical theme in Latino studies is that minority students have a tendency to “internalize a state of mind that they belong in a subordinate status and are less than the dominant group” (Acuna, 1988; Blauner, 1972; Fanon, 1967). “These youths frequently tie their Chicana/o identity with inferior inscriptions rather than positive proscriptions. Their identity is a liability rather than an asset in relation to mainstream America” (Bejarano, 2005, p. 45). Unique stresses heighten minorities’ sense of not belonging therefore undermining academic confidence, performance, attachment and persistence.

The content of the curriculum in most classrooms is designed to be relevant almost exclusively to the typical middle class white child of the dominant society. Although there have been improvements made to textbooks, source materials, and teacher training, even in this day and age, current research indicates a different predisposition in attitude on the part of teachers working in schools with high percentages of minority students. Standardized tests rarely make use of the skills and experiences, which are familiar to children of Mexican descent and with standardized testing playing a greater role in schools nationwide, this lack of cultural sensitivity has serious negative implications for minority children. Valenzuela (2005) referred to the concentration of testing and narrowed curriculum as “subtractive schooling.” To clarify, the testing fad does not lead to a narrowing of curriculum for Hispanic students alone, but because of the multiple minority status, the impact is compounded.

There are hidden elements of the curriculum that maintain the potential to reproduce gender, race, class, and other forms of inequality. The "strong" form acts to reproduce stratified and unequal social relations. Philip Jackson's (1968) concept of a "hidden curriculum" was developed through observations in K-12 public schools. He noticed that the peculiar disciplines and behavioral expectations that are found in classrooms and embedded in school practices do not necessarily further intellectual development. At roughly the same time, Robert Dreeben (1968) looked at school culture and concluded that it taught students to "form transient social relationships, submerge much of their personal identity, and accept the legitimacy of categorical treatment" (p. 147). Current educational practices have the ability to reproduce inequality through the exclusion of racial/ethnic issues from the curriculum and the absence of opportunities for social interaction for minority students.

The existing literature evinces limited research in the area of ELLs, program placement models based on language, and standardized assessment, especially in the area of science. A well-known educator, lecturer, and author, Dr. Jim Cummins' work is on the nature of language proficiency and second language acquisition with particular emphasis on the social and educational barriers that limit academic success for culturally diverse students. What is happening now in the schools is not science but ideology, with federal and state policies imposing a pedagogical divide in which "poor kids get behaviorism and rich kids get social constructionism" (Cummins, 2007, p.1). In practice, that means skills for the poor and knowledge for the rich. "That ideologically based approach ignores and rejects research into the way students learn, particularly how they learn language and how to read" (Cummins, 2007, p.1).

Comparing the research into instructional methods that work, with what actually happens today in the schools, particularly in inner cities, it is "very clear," Cummins (2007) said that the current approach in too many U.S. schools is 90% ideology and 10% science. Research is ignored, misunderstood, misinterpreted and distorted to favor that ideology. Cummins (2007), noted:

Schooling has been reduced to the transmission of scripted skills and facts to the exclusion of inquiry, critical literacy, and social awareness. In schools across the country, instruction focuses relentlessly on teaching to the test. This is particularly the case in schools in low-income areas, which are considered most at-risk of failing to demonstrate 'adequate yearly progress' (p. 3).

Blades (2007) cited an ESL Maryland public school teacher who calculated that in the 2004-2005 school year, English learners in a fifth-grade class took five different standardized tests, some of them more than once. As a result of the excessive testing a teacher wrote, "my students missed 33 days of ESL classes, or about 18% of their English instruction due to standardized testing" (p. 3), during the course of the academic year.

According to Toppo (2007), researchers agree, "The typical child in the USA stands only a 1-in-14 chance of having a consistently rich, supportive elementary school experience" (p.1). Those findings, published in the weekly magazine *Science*, take teachers to task for spending too much time on basic reading and math skills and not enough time on problem solving, reasoning, science and social studies. Teacher knowledge about students' social associations and cultural nuances may be helpful to teachers as they endeavor to capitalize on and improve the social dynamics and

learning outcomes of their classrooms (Pearl, et. al., 2007). It is critical for educators to achieve the dual goals of promoting high academic achievement while simultaneously pursuing educational equity for diverse student groups.

Another potential barrier to the academic success of culturally diverse students is the concept of restricted linguistic codes found in the large proportion of working class individuals in minority groups. This proportion is especially true in the district under study. In the U.S., the class system is experienced in ways so specific to age, race, geography, religion, ethnicity and nationality that class alone rarely seems to create a sense of kinship.

One can journey into the substance and psychology of social class through the medium of culture. The vehicles are the communication systems people use, and they will change as the terrain changes. A foundational point is that working and middle class people live in different cultures; this is reflected in and recreated by the systems of communication they use. Secondly, the communication processes taught in early childhood select different skills and meanings for children of different social classes, which lead to different worldviews. A third point grows out of the second: working class culture is not as easily tracked though an exclusively linguistic process and needs to be augmented with the observation of other ways that meaning is made and communicated. Finally, it can be observed that often working class culture accesses and honors aspects of human life and a kind of consciousness which has value for all people, however they are ignored or disrespected in the dominant society (Leondar-Wright, nd).

The "working class" is a reference to all people who work with things and their hands for a living, not just the industrial working class. The middle classes are people who work professional jobs, who work with symbols rather than things (Jensen, 1997). These are not entirely discrete categories but are rather like fields of culture that overlap. Working and middle class income levels overlap, too, but one knows in a moment which is the schoolteacher and which the construction worker. The fact is that each has come from a different world, each with its own integrity. The classes produce differences in who people are, in how they think and speak, and in how they regard themselves and the world around them. Indeed, American society is largely shaped by that middle class culture. The professional middle class, by definition, selects and creates all the images and representations of "society." Behind the over-bright culture of the middle class, it is not so easy to see the particulars of working class culture, which is also hidden by its own tendency to emphasize "hanging out" over "standing out."

Everything that can be said within academic convention is, by definition, translated into the language and culture in which it lives, that of the professional middle class (Leondar-Wright, nd). This translation inevitably occludes that which middle class language (and culture) does not recognize or understand. It is within this paradox that one can enter into the study of cultural differences- through the medium of language. One way to get around the language conundrum is to allow both working and middle class voices to speak. Language is the medium and message of culture.

Basil Bernstein made a remarkable contribution to the understanding of class as culture when he discovered that class differences in speech were profound enough to demonstrate that language was actually being used for different purposes. He saw

these reflected in two different linguistic "codes": the "elaborated code" found in the middle class group and the "restricted code" found in the working class group (Bernstein, 1971, 1990). With increasingly specific and detailed analyses, his theory explains how codes are a function of, and reproduce the unequal division of labor in a society.

An "elaborated" linguistic code is a more formal and verbally flexible use of language. It emphasizes individual verbal elaboration. The elaborated code has many structural and vocabulary options to allow and command people to use language to be precise and explicit in what they say. It allows the speaker to clearly differentiate one idea from another. As such it is well prepared for abstraction and is the kind of language needed in academic and professional communication. It is a universal language; it speaks to a general, non-specific audience. Meltzer (1978) used as an example the response from a middle class person when asked where chewing gum is usually purchased. The reply was: "At a cashier's counter or in a grocery store." The working class people said, "at the National," or "from Tony" (Strauss & Schatzman 1955, p.337, from Meltzer, 1978). Bernstein noted that to be performed well, an elaborated code typically requires formal education (1971). It is the signal of a culture, which prizes individuality and the competition between outstanding individuals. This is the kind of speech where words are used as bricks and boards with which one can attempt to systematically build the house of language, self, and society.

By contrast, the "restricted code" used by working class people is implicit rather than explicit. The amount of explication and specificity in the speech of working class people is more limited, hence the linguistic description "restricted." Bernstein noted

early on that only verbal elaboration was restricted, while gestures, meaningful glances, variations in vocal tone, volume and pace were used more freely than in the middle class group. People in the group understand the gestures and nuances, but an outsider would not understand half of what was going on. The speech they learn to use is not designed to speak in a universal manner. It is designed for members, not outsiders. Therefore, it serves to connect people from within and to keep outsiders out.

It is not that working class people do not like to talk, it is that when they do they produce narratives, they tell stories, rather than "download" information or produce abstract encapsulations of concepts. Again, the stories they tell are filled with implicit references to people and places in their lives (Bernstein, 1990, Adlam, et al, 1977). It is not, as some might suppose, that the working class person is so ignorant that they think the interviewer knows who "Tony" is or where "the National" is. The speech they learn is for particular people who share their lives.

Clearly, middle class people maintain personal connections and working class people certainly feel the strain of (middle class) society's valuing of "somebodies" over "nobodies." Indeed, these areas of overlap are crucial to understanding the codes because the edges are dynamic locations of conflict, oppression, and change. Nonetheless, in the extremes of the codes the cultural underpinnings of the difference between middle class and working class can be found. One is a culture that values, and recreates, individuality and competition, and expects its members to "become" all they can in society. Working class culture, by contrast, is a culture of tribal-like "belonging," of what Noddings called "personal and particular" connections (1989). As such, the

cultures stand in sharp contrast to each other. Whatever variation may be woven into the basic patterns, they point their members in different and opposing directions.

Bernstein's focus has always been the effects on working class children of middle class culture, code, and control in schools. There we can see how these codes and cultures are reproduced in early childhood and how this may shape a child's sense of identity. This work and the research methods it employed may be dated but there is a common-sense truth to it that still makes it useful as a jumping-off point.

Bernstein's classic example of psycholinguistic training in middle class children is in the mother who says to her child, "I'd rather you made less noise, Darling." However idealized this sentence may be, it is paradigmatic of middle class speech. First there is the characteristic "I" and "you" and the development of individuality through the negotiation between these "I's". A predictable middle class child's response might be banging the toy truck a little less loudly, saying, "Is this less?" The middle class mother's response: "Not enough, dear." He would bang a bit less loudly, "How 'bout this?" "That's still too loud, Honey." At this point he might start barely touching the truck to the floor, "Mom! What about this?" "That's better, thank you," she might say. It is not so much that the child was concerned with finding the exact amount of noise he could make, of course, as that he was fascinated with the game of negotiation (and wanting to keep his mother's attention). She, too, was interested in what they were doing together, less about the noise than about the way they were engaged. She was concerned with the kind of boy her son was, how he learned to negotiate conflict, and she was using the medium of language to shape that.

The sentence contains other operative features that are paradigmatic of middle class speech and culture. In addition to the I/you distinction there is "rather" and "less." The child is trying to figure out how much is "less," or, more precisely, how much is "less" enough to please his mother. Again, we see the encouragement of negotiation occurring simultaneously with, and through, language acquisition. "Rather" is not must, again there is the "I" who can decide whether or not he will please his mother. Similar examples of this kind of middle class family dialogue were seen in a study of the similarities and differences between classes conducted by Lareau (2003). Lareau (2003) found that throughout this process he is developing a sense of agency and an ability to negotiate across roles, parent and child, and, later, teacher and student.

If the child pushes too far, it is likely that the mother would tire of the game. "I'd like you to put that toy away now and find something else to do." "What if I don't?" he might ask. "We won't go for ice cream later." Another feature of middle class speech emerges: a sense of means and ends becomes explicit. Now he has to choose, but the choice is his. In this way he also learns that he has the means to create the ends he wants. From the standpoint of psychological development, one can see how these things can facilitate, indeed necessitate the development of a certain kind of logical reasoning and internal speech (Jensen, 1997). The child sits silently for a bit. "I'm going to go watch TV!" he announces and dashes out the door. All of these things- individuality, negotiation, hierarchy and the proper methods to negotiate across levels, a choice of means to lead to desired ends are fundamental institutions in both middle class speech and in middle class culture.

When comparing the interaction of the working class child and mother in a similar situation, a child banging a toy truck against a floor, a parent might say, "That's enough!" A more gentle approach, on a less harried day, might simply guide the child away from the offending truck and distract him with something else. The first thing that should stand out is the lack of all those middle class skills: development of self, negotiation, means and ends, a sense of individual agency, and role negotiation (Lareau, 2003). There would seem to be little encouragement to develop reason and internal speech in such a situation. Ideally, a society could integrate the best aspects of each of these cultures. The fact that these cultures exist in opposition to each other makes imagining their integration difficult.

The last educational barrier addressed in this section of the literature review is the lack of qualified bilingual certified personnel. The large numbers of English language learners creates a need for greater numbers of bilingual certified teachers. Bilingual/ESL teachers represented the greatest elementary teacher shortage in Texas during the 2001-2002 school year (Lara-Alecia & Galloway, 2004). The shortages of qualified bilingual and ESL certified teachers forced Texas to develop alternative certification programs and certification routes.

One approach that Texas implemented to increase the number of teachers with Bilingual/ESL certification was to encourage certified Texas teachers to participate in the state certification exam (TEXES). In Texas, teachers already certified in other areas can participate in and receive Bilingual or ESL certification by exam rather than through university coursework followed by the exam. Districts and regional education service centers offer courses designed to help teachers pass the certification exam. Teachers

take an exam and receive certification, but when ELLs enter their classrooms, they are often without the resources and training necessary to meet the linguistic and academic needs of the students while also addressing the state curriculum and objectives.

Texas is one of 29 states that implemented licensure requirements for teaching ELLs, which consists of passing the TExES certification exam. Even though creating certification requirements acknowledges the need for increased training, knowledge and skills to teach in a bilingual setting, there are still limitations within the certification process. Mitchell and Barth (1999) asserted that state licensing tests do not “certify that teachers have the breadth and depth of subject knowledge to teach all students to high standards” and “subject-area tests are too weak to guarantee that teachers have the content they need to teach students to high standards” (p. 3). To meet increasing demand for teachers, state policies also contain loopholes, which allow some teachers to enter classrooms even if they have failed their licensing exam. By waiving requirements, states often permit teachers to enter classrooms even if they have failed their exam or failed to meet other requirements (Education Week, 2000). Therefore, even with a state licensure exam in place, there are multiple routes to bypass the state requirements.

Mainstream teachers who obtained their English as a second language (ESL) certification or Bilingual certification, by exam only, are faced with increasing numbers of English language learners (ELLs) in their classrooms. They must help ELLs develop the academic language and skills they need to reach high levels of academic achievement as measured by various state assessments. Decreasing standards for ESL and Bilingual certification and increasing accountability for ELLs has made teachers' role in

effectively increasing the language and academic skills of ELLs an area of major concern. A lack of student academic language will affect test scores, especially in science where there is so much technical and high level vocabulary. But when many teachers themselves lack fluency in academic Spanish, it interferes with the ability to provide that technical, high level, academic vocabulary that is present in quality instruction.

Jim Cummins is also a leading researcher in the field of second language acquisition. His theories address the role of the first language on second language acquisition and cognitive development. BICS and CALP refer to the nature of language with regards to social context. Slide 1 presents how the acronyms BICS and CALP refer to a distinction introduced by Cummins (Cummins, 1979, 2000; Cummins & Swain, 1987) between basic interpersonal communicative skills and cognitive academic language proficiency.

Slide 1: Social versus Academic Language

<b>Social Language</b>	<b>Academic Language</b>
<ul style="list-style-type: none"> <li>*Simpler language (shorter sentences, simpler vocabulary and grammar)</li> <li>*Usually face-to-face, small number of people, informal settings</li> <li>*Precise understanding is seldom required</li> <li>*Usually simpler, familiar topics (movies, friends, daily life)</li> <li>*Get many clues from expressions, gestures social context</li> <li>*Many opportunities to clarify (look puzzled, ask questions, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>*Technical vocabulary; written material has longer sentences and more complex grammar</li> <li>*Often lecture-style communication or reading a textbook; little situational context</li> <li>*Precise understanding and precise description/explanation is required; higher-order thinking</li> <li>*New and more difficult to understand topics, knowledge is often abstract; cognitively complex; student often has less background knowledge to build on</li> <li>*Fewer clues, most clues are language clues</li> <li>  such as further explanation</li> <li>*More difficult to clarify</li> </ul>

Slide 1 demonstrates the distinction that was intended to draw attention to the very different time periods typically required by children to acquire conversational fluency in their second language, as compared to grade-appropriate academic proficiency in that language (Cummins, 2001a). BICS, or Basic Interpersonal Communication Skills, refers to conversational language that is used in informal social settings: playgrounds, cafeterias, school buses, and social activities in the classroom. These situations usually provide students with context clues and visual support; they are cognitively undemanding. Students may develop conversational fluency in their second language in as little as six months to two years (Cummins, 1981). These language skills are developed at home and in informal situations. They develop naturally without formal instruction.

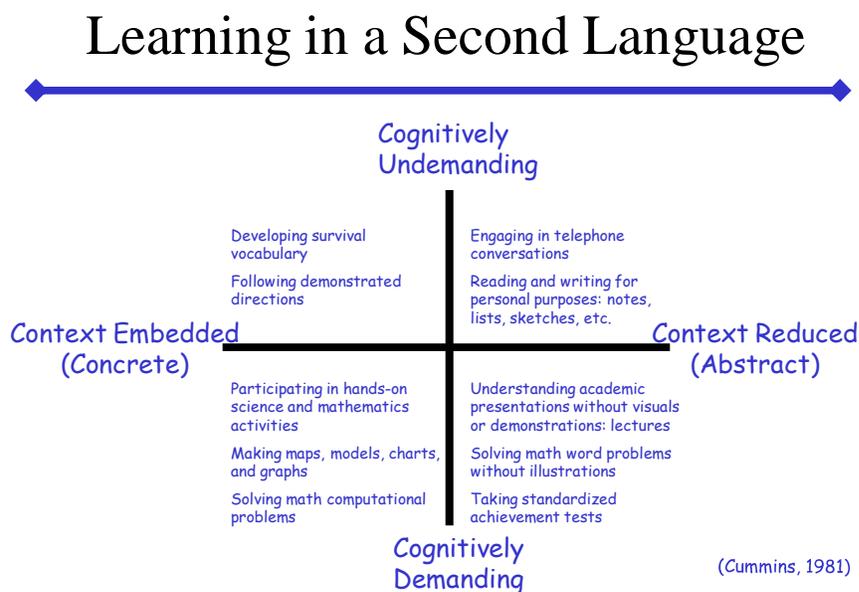
CALP, or Cognitive Academic Language Proficiency, on the other hand, refers to the language and cognitive skills that are necessary to participate and perform in the mainstream classroom curriculum and on standardized tests. These language skills and concepts are learned and developed within the context of the classroom and cover a variety of subjects. The CALP skills rely on the learners' ability to perform in a cognitively demanding and context-reduced environment. It is the language used for academic tasks such as comparing, contrasting, summarizing, or inferencing. "CALP also includes the academic language of the disciplines, the highly specialized language that is used to conceptualize the teachings and understandings of the given subject matter. CALP is used to establish affiliation in particular schools of thought and to bring legitimacy to the ideas shared in academic or power-laden settings" (Izquierdo, 2008, slide 6). BICS are acquired more quickly than CALP and are often easy to observe.

Cognitive and academic language may take five to seven years for second language learners to develop (Cummins, 1981a).

Many authors (Krashen, 2005; Collier, 2002; Cummins, 1981) refer to the length of time students need to acquire academic language in their discussion of the difficulties language minority students face in mainstream classrooms and their levels of language proficiency. While many students have the language skills to be socially successful, they lack the academic language proficiency that is needed to be academically successful. This dilemma becomes even more relevant because of the inclusion of English language learner students in standardized assessments.

Cummins first introduced the notion of BICS and CALP in 1979 in his paper titled “Cognitive /Academic Language Proficiency, Linguistic Interdependence, the Optimum Age Question and Some Other Matters.” His distinction highlights the differences in the time students need to develop different linguistics skills. Yet schools and practitioners informally assess ELLs based on their conversational skills, and often mistake conversational fluency for academic fluency. This can also happen when assessing whether or not a teacher has the proficiency to teach academic content in a second language.

Slide 2 presents the model that Cummins developed to show the categories of language tasks related to BICS and CALP in learning a second language.



Slide 2 demonstrates that a second-language learner (adult or child) begins with activities that are context-embedded and cognitively reduced. Examples include, following directions, art and music classes, basic conversations, and buying lunch in the cafeteria. The person then moves through other quadrants of the model until he arrives at activities that are cognitively demanding and context reduced. For example, lectures, standardized tests, and reading and writing represent cognitively demanding and context reduced activities. The essential aspect of academic language proficiency is the ability to make complex meanings explicit in oral or written modalities by means of language itself (Cummins, 2000).

This concept of the differences between the social language that develops naturally and the academic language that is required for academic success and also the amount of time students require to develop and acquire those different proficiencies is

complicated (Azzam, 2005). Teachers representing a wide variety of experiences, Spanish language proficiency, certification routes and understandings of second-language acquisition are leading classrooms faced with the challenge of increasing academic language proficiency and content-area knowledge as quickly as possible in order to show positive gains on the state-mandated assessments. Teachers are expected to accomplish that task without a strong Spanish academic language of their own and/or background in second language acquisition, language development, and language teaching. Classrooms are filled with teachers with little or no specialized training regarding educating English language learners (Carrasquillo & Rodriguez, 2002; Spangenberg-Erbschat & Pritchard, 1994).

Dentler and Hafner (1997) assembled synthesized results of research to form a list of components related to effective instruction and the academic achievement of ELLs. Dentler and Hafner (1997) developed categories that lead to an ideal instructional delivery system for English language learners. The first category relates directly to the teacher. Fullan (1990) and Olsen and Mullen (1990) independently found that teachers must be qualified in their field, teacher ethnic/linguistic profiles should match that of their students; there is a need for effective staff development; and positive attitudes and morale must be present.

Population projections suggest that schools and classrooms will continue to receive increasing numbers of English language learners; therefore, the need for qualified teachers will also continue to grow. Policy makers and administrators must consider teachers' preparedness, practices, and needs as they continue to make decisions regarding effectively educating ELLs and increasing their academic success.

## Bilingual Education

One of the first major issues in public education surfaced between 1830 and 1850, when more than one million Catholic immigrants arrived in the United States (Barger, 1996). The dominant culture in America was Protestant. Schools reflected this culture through their administrative and instructional practices. The King James translation of the Bible was considered a school text, and school leaders would not allow the use of the Douay Version or Catholic devotions to address the enrollment of non-Protestant immigrant children. Fearing that their children would lose their Catholic identity, the Baltimore Council, a Catholic entity, prohibited Catholic children from attending public schools and established Catholic schools. Public funds were not provided for Catholic schools, and the working class, who could not afford tuition and taxes, continued to send their children to public schools (Ratner, 2000). This first challenge in public education was important for several reasons: cultural diversity became an instructional issue; the use of public funds to educate culturally diverse students became a financial issue, and protecting the rights of culturally diverse students became a judicial and legislative issue.

Another cultural issue related to immigrants began to surface in the late 1800s. Immigrants in rural communities had been educating their children in their native languages, rather than English. When English-speaking families moved to the Midwest, where Germans, Belgians, and Scandinavians were established, concern regarding the language of instruction began. Other areas in the United States also had to address this problem. Ohio was the first state to adopt a bilingual education law in 1839 that allowed German-English instruction at the request of parents. Louisiana followed suit in 1847 by

passing a similar law that allowed French-English instruction (Fishman, 1966, in Hansot & Tyack).

In 1848, the United States and Mexico signed the *Treaty of Guadalupe Hidalgo*, officially giving Mexicans the right to speak Spanish in the United States, and permitting bilingual or monolingual instruction in public schools. In permitting instruction in English and Spanish, the *Treaty of Guadalupe Hidalgo* created legal recognition as well as unofficial public acceptance of non-English instruction. By the 1870s, bilingual education had received favorable comments in the United States (Fishman, 1966, in Hansot & Tyack).

Oregon legalized monolingual schools in 1872 and eight states created legal provisions for bilingual education within the next decade, recognizing the economic and political need for this legislation (Hansot & Tyack, p. 79). Political divisions were clear: “Republicans favored homogenization while Democrats embraced a tolerance for cultural differences” (Tyack, 1966, in Tyack & Hansot, 1982, p. 81). The bilingual controversy continues today.

Public education experienced heightened demands from minority groups that insisted on equal access to education in the 1960s. Minority activist groups agitated for minority rights through formal political pressure and broad social organization. At this time, public schools responded by diversifying and providing access to students of minority status. An article published in 1961 in the *Saturday Evening Post* stated, “Each year, in thousands of schools around the country, small children with names like Juan or Janos or Gianni start their education in an atmosphere of discouragement and frustration (Alexander, p.1). At that time, at least 70 percent of these children were not

promoted at the end of the school year. Many of them eventually had to repeat second and third and fourth grade too. After a while the youngsters would simply quit after making far more than a token effort (Alexander, 1961). Their schooling was a painful experience, with failure their usual reward. The corrosive taste of failure is only intensified as these children grow up. Over 40 years later, this situation of children stumbling through the public school system is not really that unfamiliar or outdated.

More than 40 years have passed since the inception of federally funded bilingual education in the United States (Fralick, 2007). The absence of formal structures to assure that successful inclusion of all students takes place leaves students to develop their own resources. This may have been appropriate when education was essentially middle-class White males teaching other middle-class White males. At that time a certain homogeneity of cultural capital could be assumed, and if a student could not marshal that capital to compete vigorously in the academic setting, one might conclude that the "bizarre" student just was not going to make it. The old model implied "reproduction" of mainstream society. This message is embedded in the everyday experiences of the classroom. This is maintained through various practices, including the exclusion of others. Not surprisingly, minority students encounter difficulty fitting into programs designed for students from different racial, class, and cultural backgrounds, because they originally have little, if any, of the cultural capital that the dominant non-minority students possess.

Bilingual education has a long, hotly debated history. The issues that have been fervently debated are program type and program duration. The debate continues today, influencing educational policy makers, administrators, teachers, and parents. Their

decisions affect the lives of children. In this era, where the number of language minority students is larger than ever, instruction must serve student needs. Accurate data will identify these needs.

With different levels of effectiveness, various instructional models for delivering instruction to English-language learners are implemented in public schools throughout the country. Increased academic achievement for second language learners must first begin with a well designed and well implemented bilingual program that is consistent throughout the district beginning in the elementary grades. According to Crawford (2004), there are several different program models for educating English Language Learners. These models include immersion, ESL pullout, Transitional Bilingual Education, One-Way Bilingual, and Two-Way Bilingual (Dual Language) Education.

It might be presumed that some of these models play a role in such disparate outcomes. "Research on second language acquisition indicates linguistic and cognitive advantages of biliteracy, in that literacy and proficiency in one language promotes cognitive and metacognitive abilities as well as the acquisition of additional languages" (Lee, 1999, p.93). In contrast to the controversy in the media and among some policymakers about bilingual education, there is considerable consensus among applied linguists about the potential benefits of well-implemented bilingual programs (Cummins, nd).

As documented in numerous sources (Baker & Prys Jones, 1988; Cummins & Corson, 1997), "students educated for part of the day through a minority language do not suffer adverse consequences in the development of academic skills in the majority language" (Cummins, nd, p.2). This pattern emerges among both majority and minority

language students, across widely varying sociolinguistic and sociopolitical contexts and in programs with very different organizational structures.

The *No Child Left Behind Act of 2002 (NCLB)* focused national attention on educational practices and their results, particularly among disadvantaged and minority students. Achievement scores must improve in order to “narrow the gap” between disadvantaged students and non-disadvantaged students in the various subpopulations (Mathews, 2003). The reforms contained in the *No Child Left Behind Act* affected millions of English learners and allowed each state to select the type of bilingual program that it will support using the funding attached to NCLB.

In the past, Title VII funded bilingual education. Proponents of the English Immersion approach noted the difference in the language of the Act (Soifer, 2002). In fact, Part A of Title III of the NCLB Act called the “*English Language Acquisition, Language Enhancement, and Academic Achievement Act*,” states that one purpose of the Act is “to provide State educational agencies and local educational agencies with the flexibility to implement language instruction educational programs. These programs are to be based on scientifically-based research on teaching limited English proficient students that the agencies believe to be the most effective for teaching English” (P.L. 107-110, Section 3102).

What the research evidence has suggested is that the study of bilingual education is fraught with numerous differences of opinion. Conclusions drawn from research evidence on the effectiveness of bilingual education programs have often been controversial. The well-known Baker and De Kanter Report of 1983 leveraged one of the most serious scholarly challenges to the validity of bilingual education. Baker and

De Kanter argued that Structured English Immersion (SEI) promotes content and English can be taught together by teaching content through learner-appropriate methods. In their longitudinal report about the effectiveness of bilingual education, they posited that too much use of the non-English language in the classroom is very damaging to the learning of English for the ELL (Baker & De Kanter, 1998).

Ann Willig (1985) presented a meta-analysis review that was favorable to bilingual education. She combined academic achievement scores from a large set of statistically unrelated studies. It was a partial replication of the Baker and De Kanter Report. Her findings concluded that native language use is important as a vehicle of instruction. She also discovered that bilingual education had been badly served by a lack of adequate research (Willig, 1985). Jay Greene (1998) made a scholarly metaanalytical report in a systematic and statistical review of the literature of the effectiveness of bilingual education. His findings indicated that students with limited English proficiency who are taught using at least some of their native language perform significantly better on standardized tests than similar children who are taught in English only. Most recently, Rolstad, Mahoney, and Glass (2005) in another metaanalysis report on ELLs showed that bilingual education is consistently superior to all-English approaches and that developmental bilingual education programs are superior to transitional bilingual education program.

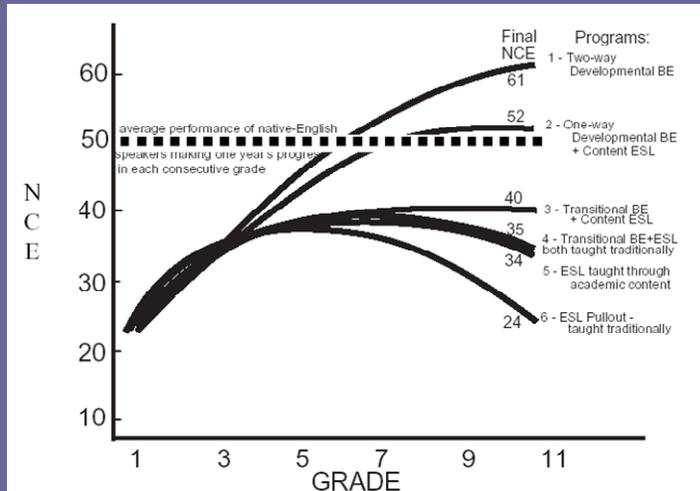
Later, the Ramírez Report, an evaluation study conducted during a four-year period with 2,000 Spanish-speaking students in five states, refuted the Baker and De Kanter Report, "Federal Policy and the Effectiveness of Bilingual Education (1998), by demonstrating that "late-exit," developmental bilingual education programs proved

superior to “early-exit,” transitional bilingual programs and English-only immersion programs, substantiating the long-term benefits of late-exit bilingual programs (Ramírez, et al, 1984). This study clearly demonstrated that sustained promotion of children’s primary language can serve as an effective route to academic excellence and literacy in two languages (Cummins, 1991). He countered the idea that intensive exposure to English is the “best way to teach language to minority children” (Cummins, 1991).

Thomas and Collier (2001) completed a very thorough and comprehensive five-year (1996-2001) research project, which studied culturally diverse students, with particular focus on English learners in grades kindergarten through 12th. That study is especially significant to this study because Houston, Texas, was one of the five regions that was selected throughout the United States. In Texas, they conclude, “tolerance of bilingualism is the general social response to Hispanics” (Thomas & Collier, 2001). Slide 3 presents a comparison of results aggregated from a series of longitudinal studies of well- implemented, mature bilingual programs in five school districts from 1998-2000.

Slide 3: ELLs Long Term Achievement in English Reading Across Program Models

- Program 1: Two-way developmental bilingual education (BE), including Content ESL
- Program 2: One-way developmental BE, including ESL taught through academic content
- Program 3: Transitional BE, including ESL taught through academic content
- Program 4: Transitional BE, including ESL, both taught traditionally
- Program 5: ESL taught through academic content using current approaches with no LI use
- Program 6: ESL pullout - taught traditionally



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What is found in slide 3 is that the ELLs long term achievement in normal curve equivalents (NCEs) on standardized tests in English Reading, compared across six program models, is in the initial stages all programs experience relatively the same performance growth. After about three years however, the two-way model students significantly outperform the others. The one-way students then follow ahead of the transitional and ESL programs. Several large-scale studies have shown that it usually takes at least five years for second language learners to catch up academically to their native English-speaking peers but conversational fluency is often attained within two years of intensive exposure to the language (Cummins, nd).

One of the most recent studies, the Report of the National Literacy Panel for Language Minority Children and Youth (2005) stated that focusing on instruction on key components such as phonemic awareness, decoding, oral reading fluency, reading comprehension, vocabulary, and writing has apparent benefits, but that proficiency differences in students of second language requires adjustment in instruction to meet these students' needs (Rolstad, Mahoney, & Glass, 2005).

The Texas Successful Schools Study: Quality Education for Limited English Proficient Students (2001) is one of the most significant reports that substantiate the earlier expressed guiding assumption that bilingual education works. The effective schools correlatives that were used are: (1) a clear school mission; (2) high expectations for success; (3) instructional leadership; (4) frequent monitoring of student programs; (5) opportunity to learn and student time on task; (6) safe and orderly environment; and (7) home school relations (Cárdenas & Seidner, 2001).

Research evidence on well-designed, well-staffed, and well-funded bilingual education programs overwhelmingly points to positive, achievement-gap reducing effects (Cárdenas, 2001; Thomas & Collier, 2001). Tinajero (2005) claimed that "Texas is poised to be the model for bilingual education; a paradigm of what is possible when children's cultural and linguistic diversity are treated as assets." Ample evidence has thus accumulated which shows that bilingual education can be an effective tool for educating students whose primary language is a language other than English. The findings and conclusions have shown that dual language, late-exit, and maintenance programs are the most effective relative to transitional programs (Ramírez, 1984; Thomas & Collier, 2001; Willig, 1985; Greene, 1998; & Rolstad, Mahoney, & Glass,

2005). With respect to English acquisition, native-language instruction is part of the solution, not part of the problem (Krashen, 2005).

In a two-way bilingual (dual language) setting, an equal number of English-dominant students are schooled with ELLs. The goal of this model is to develop strong bilingual and biliteracy skills among both groups of students. This 50/50 model is based on the belief that both languages need to be acquired from the beginning of schooling and that the best way to do this is to split the instructional time between the two (Cummins, nd). Besides showing that Spanish dominant students along with their English speaking counterparts are able to perform at or above grade level when they have completed their elementary schooling in a TWB program (Collier, 1992), there is also persuasive evidence indicating that children so schooled develop positive attitudes toward cross cultural interactions (Lambert & Tucker, 1972).

According to Izquierdo (nd), an expert on dual language classrooms, special needs students, literacy acquisition, and bilingual curriculum design,

The goals of two-way dual language education include, as a minimum, literacy development in two languages (L1 and L2), high academic achievement at or above grade level, and an appreciation and respect for all languages and cultures. Two-way dual language integrates a balance of native speakers of English with native speakers of another language so that all students become first-language models and second-language learners (p.1).

In 90/10 models, children learn to read and write in the L1 before L2. Children in this model move gradually through the oral component of the second language systems

in grades K-3” (Izquierdo, nd, p.3). The focus of this model is to develop literacy, phonemic awareness, phonics development and phonemic inventory predominantly in L1. L2 systems are learned after L1 is developed. “Although they crack the code of English at a later time in this model, children are still managing two language systems” (Izquierdo, nd, p.3).

In regards to bilingual education, Izquierdo (nd) goes on to explain “core curriculum is delivered through both languages. Students learn language through academic content-not in isolation” (p.1). The academic debate about bilingual education has been ongoing since the inception of bilingual education both at the national and state levels. Jim Cummins (1991) stated that few issues in North America have become as volatile or as ideologically loaded as the debate on the merits or otherwise of bilingual education. Research has played a prominent role in this academic debate. Rosalie Pedalino Porter, Director of the READ Institute and Chairman of the Massachusetts Commission on Bilingual Education, confirmed that the longer English immersion programs are in place, the higher the achievement scores of students on reading, language and math tests in English (Porter, 1996).

The ELL population continues to rapidly increase while effective and additive bilingual education policy is on the decline; the academic achievement of ELLs is deteriorating in the face of substantiated civil rights violations, growing anti-immigrant sentiment and a contentious legislative atmosphere.

Bilingual education policy in Texas faces a well-financed threat from Structured English Immersion (SEI) proponents who try to justify the funding inequity for bilingual education. A court-ordered monitoring system for bilingual education has been replaced

by a *No Child Left Behind Act* (2001) mandate that neither secures nor ensures equal education opportunity for ELLs. Current bilingual education training programs are underfunded and under-populated when the growing enrollment of immigrant students, creates a critical demand (Pompa, 1998).

### Growth of Language Minority Students and the Achievement Gap

The *No Child Left Behind Act* identified a national need to address the academic achievement of minority populations, specifically, Hispanic and African American students. Over the course of American history, the educational achievement of minority students has remained consistently below that of their White, non-Hispanic peers, despite previous efforts to eliminate achievement gaps.

It is true; “the nation’s educational institutions must educate an increasingly larger and more diverse student population, a growing share of which is lagging behind the rest in educational attainment” (Hernandez & Charney, 1998; McPartland, 1998; Vernez & Abrahamse, 1996). Given that Hispanics are rapidly becoming the nation’s largest minority, it is of social concern that “Hispanic immigrants are the least likely to attend high school and college, a finding consistent with differences among racial/ethnic groups for the native born as well” (Contreras, 2002, p.135). Disabled, LEP, and minority students fail state graduation tests at much higher rates than other students. “Even in Texas, which according to some studies has made significant progress in reducing the achievement gap on its high school test between Whites and other students, the failure rates for Hispanics students was more than double that of Whites as of 1998” (Fuhrman, 2003, p.5).

The gap that exists between minorities and their non-minority counterparts underscores the problem Texas faces in reconciling its population transformation. According to Scharrer (2007), more than 60 percent of the first graders in the Dallas and Houston school districts are Hispanic. In El Paso, it's 81 percent. In Scharrer (2007), Texas State Senator Shapleigh is quoted as saying, "And roughly 40 percent of those children are classified as limited-English proficient. Texas runs the risk of running out of a skilled labor force unless children are educated and learn English" (p.1). Shapleigh went on to explain that English is not being spoken in the homes, which means that children arrive in school unable to navigate the language without special help (Scharrer, 2007, p.2).

Hispanics continue to make up an ever-growing part of the state's 4.5 million public school enrollment. Last year, Hispanics represented 45.3 percent of the total enrollment in Texas, while non-Hispanic whites made up 36.5 percent (Scharrer, 2007, p.2). It is not only in Texas that the growth of minority and/or English language learners can be seen. This growth transcends state boundaries nationwide.

Hispanic Americans currently represent the largest minority and fastest growing ethnic group in the United States. In 2002, Hispanics made up 13.3 percent of the U.S. population, compared to White non-Hispanics, 69 percent; African Americans, 13 percent, and Asian and Pacific Islanders, 4 percent. This percentage of Hispanics is projected to rise to 22 percent by the year 2015 (U.S. Census Bureau, 2003).

Having experienced this remarkable population growth, Hispanic Americans' representation in U.S. schools has also increased substantially. With 35 percent of Hispanics being under the age of 18 (compared to 23 percent of White non-Hispanics),

Hispanics account for the second largest segment of the U.S. school population after White non-Hispanics (National Council of La Raza, 2004) and are projected to make up 25 percent of the total school population by the year 2030 (U.S. Department of Education, 1996). Furthermore, the distribution and concentration of minorities is uneven, and in certain states, including Texas, the percentage is much higher.

Yet, despite their growing numbers, Hispanics continue to lag behind other ethnic groups in their educational achievements. According to the U.S. Department of Education (1996), a history of discrimination based on language, low socioeconomic status, cultural barriers, and discriminatory practices, such as de-facto segregation and under-funding of minority-serving programs and schools, has resulted in Hispanic students trailing behind their peers through all levels of public education.

In education, Bourdieu's work helps explain why minorities and non-minorities do not succeed at the same rate. "Bourdieu asserts that cultural capital (i.e., education, language), social capital (i.e., social networks, connections) and economic capital (i.e., money and other material possessions) can be acquired in two ways: from one's family and/or through formal schooling" (Yosso, 2005, p.78). Dominant groups are able to sustain the power they have in society as long as the access for acquiring the necessary components of capital are limited and or difficult to attain. This theory provides a structural critique of social and cultural reproduction.

In a research study by Satterfield, Rincones, Stein & Edens (2005), they found that although the growth of Hispanics in the U.S. has been relatively high and steady, their access and educational attainment is not comparable to other ethnic groups.

Access of Hispanics to K-12 and higher education has been mainly due to pressure influenced by demographic growth rather than the demands from Hispanics themselves.

The United States' student population of language minority students is rising dramatically. There are approximately 13 million school-age students whose primary language is not English (Federal Interagency Forum on Child and Family Statistics, 2005). For teachers, this means that educating ELLs does not just involve teaching academic content but also should involve helping them learn a second language and pass a statewide assessment. Moreover, even when students have been reclassified as English proficient, they still may need help to refine their academic language skills (Siegel, 2007). The number of limited English proficient students and bilingual programs being implemented are growing much more quickly than materials are being made available and teachers are being trained (Garcia & Baker, ed., 2007).

The diverse student body of today produces a paradox: How can the hidden curriculum "reproduce" the continuous unequal performance among different subgroups? Only by making the functioning of this curriculum visible can the hidden assumptions, failures, and gaps that have made it unnecessarily difficult or impossible for some students to survive public education be overcome.

Addressing the academic achievement of the minority populations for the sake of America's future on the world stage has become urgent. The focus of this study is the minority language student living along the Mexico-Texas border. The border geographic location facilitates the study as the migration from Mexico continues, as well as the problems in closing the achievement gap that persist for learners, their families, educators and society in general.

## Impacts of High Stakes Testing

It is now appropriate to address the curriculum and programming most common in American public schools. While the intent is not to focus directly on testing trends brought about by NCLB and other accountability demands made by state legislation, much of the literature and much of the research data shows how such practices have contributed to the narrowing of the curriculum, making it even more difficult to introduce pluralistic, multi-cultural materials and perspectives. In fact, Sloan (2007) witnessed an extreme change in the ways that Latino students were treated pre-NCLB and post-NCLB as she conducted an ethnographic study in a minority majority school. Whereas the curriculum was child-centric prior to 2000, in the immediate years following the adoption of NCLB, the district level leadership regressed into a deficit mode of administration. Most educators and researchers claim that testing has had this affect on all children, not just minority children, however for minority children the affects are magnified, as is usually the case for any individual who occupies a marginal status.

“Research-based development of useful classroom assessments that are equitable for linguistic minorities is a critical but rare component of science education” (Siegel, 2007, p.864). Siegel (2007) stated: “creating fair assessments that are cognitively challenging for linguistic minorities is rare on commercially developed standardized tests” (p. 864). Understanding ELLs is becoming more crucial as the numbers of ELLs continues to rapidly increase. According to PEIMS data of October 2007, the student population in Texas was as follows: Hispanic = 2,127,647; White = 1,638,571; and Other = 828,724 (TEA, 2008).

In “Texas Assessment of Knowledge and Skills (TAKS) en español- A Spanish TAKS update”, TEA provided a background of the Spanish TAKS beginning in 1994 when the SBOE adopted a plan to develop Spanish-version assessments to evaluate the academic skills of English language learners (ELLs) receiving academic instruction in Spanish. In 1997 Spanish-version assessments were incorporated into the state assessment program. In 1999, the 76<sup>th</sup> Texas Legislature mandated the inclusion of Spanish-version tests in the state assessment program.

According to TEA (2008), the purpose of TAKS in Spanish is to measure if ELLs are learning the Texas Essential Knowledge and Skills (TEKS) curriculum in their own language as they receive academic instruction in Spanish and learn English. The assessment division noted that ELLs in grades 3–6 whose academic skills are most appropriately measured in Spanish are eligible to take TAKS in Spanish. As noted earlier, the language proficiency assessment committee (LPAC) makes the assessment decisions for ELLs.

The Texas Education Agency (2008) has shown that the transadaptation process used to develop test items in Spanish involves some limitations. In regard to the math and science Spanish TAKS, most items are transadapted from English items. Very few items are developed independently from English. Transadaptation is the translation and adaptation for cultural and linguistic appropriateness (TEA, Assessment Division, 2008).

In schools that serve large proportions of poor and minority race children, a complex web of cultural differences, lack of skills useful in school which are fostered in middle class homes and teachers’ low expectations leads to high rates of low achievement (Metz, 2003). Since persons outside teaching tend to judge teachers by

their students, teachers in schools where students achieve poorly, or who come from racial and economic backgrounds which lead others to expect them to achieve poorly, suffer public opprobrium along with their students. A study conducted by Metz (2003), exemplified the devastating effects such a set of experiences can have on the teachers and students. Schools that serve large numbers of low achievers can then be expected to have a school climate deeply affected by the faculty's attempts to deal with their own hurt pride, as well as that of the students. "As long as failure is comparatively defined, there will always be children who are failures and teachers who teach failures" (Metz, 2003, p. 225).

Pride would be less of an issue if students found school achievement of as little importance as many pretend. It is uncommon however, to find the student who does not know in some way, that school achievement as measured by test scores, is symbolic of legitimate status in society and an indicator of future rewards in work, money, power, respect and privilege. "In repeated competitive contexts, schools show those who achieve poorly that they deserve fewer later opportunities and rewards than do those who achieve well" (Metz, 2003, p.224). Texts with specified grade levels and standardized tests with scores reported in grade level equivalents or percentile rank, drive home the reality for classes and/or schools who have few high achievers present to provide a comparative and competitive stand. "Schools clearly should not hide students' true comparative standing from them, but not to stress it may be healthy" (Metz, 2003, p.225). An individual class or school's culture is not to blame. Such behavior is repeated over and over again in many schools because it is a response to

the larger society's values and its methods of allocating new generations to its adult positions.

Assessment creates additional problems in the education of ELLs (Siegel, 2007). The assessment of ELLs is a daunting equity challenge for teachers and researchers. "Assessing ELLs through written or spoken language brings up questions of validity and fairness" (Siegel, 2007, p. 865). According to Abedi (2002) in Siegel (2007), "Studies have revealed that linguistic accommodations have significant impact on students' performance in science and mathematics, and that language factors are the main influence on performance" (p. 866). Generalizability theory recognizes that scores are due to a variety of factors, including the students themselves, the items, the language of the items, and the raters who score the responses (Siegel, 2007). This approach recommends developing and refining the test items in both languages at the same time so that both versions have been validated using the same process and similar reasoning (Siegel, 2007).

The design of equitable assessments requires the careful consideration of many factors. Researchers need to consider the language and culture of students, scientific understanding, and effective assessment practices. Standards-based instruction and accountability policies in a growing number of states reinforce the mainstream view that linguistic and cultural minorities are expected to assimilate to the dominant language and culture (Fralick, 2007). These policy trends give rise to ideological and conceptual challenges for teachers working with diverse student groups. It is important to note that the problem is not accountability per se, but the inadequacies of the assessments.

The policy context of high-stakes assessment and accountability creates major challenges to differentiated, student-centered, hands-on science instruction. Teachers are under a great deal of pressure to cover clearly delineated standards and benchmarks. These policy demands tend to be felt much more strongly in urban schools where the threat of accountability-related sanctions is more serious (Lee, 1999). There is a concern that without careful considerations of equity, setting high academic standards may pose additional challenges and learning difficulties for certain students, and further “victimize students already harmed by gross inequities in the educational system” (McLaughlin, Shepard & O’Day, 1995, p. 68).

Mainstreaming ELLs poses a risk that teachers may develop negative opinions or feelings toward students as the teachers realize that students cannot and do not speak English. They then tend to blame the student, which is an oversimplification of a larger issue related to the education of ELLs (Trueba, 1987).

Accountability is a topic on everyone’s mind. In just about every state, schools are being held accountable for student performance. As states are providing remedies and enacting sanctions for low performance, policymakers are realizing the daunting implications of the task in front of them. In over half the states, students will have to pass a state test to graduate from high school; concerns about large numbers of failures, particularly for minority students, are mounting. The recent reauthorization of the *Elementary and Secondary Education Act, the No Child Left Behind Act (NCLB) of 2001*, sets new requirements for state accountability systems as a condition of federal aid for disadvantaged children. As a result, states are actively reexamining their accountability policies (Fuhrman, 2003).

Now, with NCLB, Texas school districts have two systems of accountability: (1) the state system aligned with the measures of the TAKS, and (2) the federal Annual Yearly Progress standard exacted by the United States Department of Education (TEA, 2007). This double requirement is a challenge for school districts, teachers, and parents, despite clarifications made periodically at both the federal and state level to align requirements in order to reduce the confusion that having two new standards has created.

Today's accountability systems are also distinguished by their attention to school-level performance and by their inclusion of consequences for that performance. They are quite different from earlier approaches to accountability that primarily focused on district compliance with state regulations. "The new systems grow out of a climate that draws strong parallels between education and business; they intend to focus schools on the bottom line" (Fuhrman, 2003, p.1).

The Elementary Science Grade Five TAKS test is based on the state-mandated science curriculum, the Texas Essential Knowledge and Skills (TEKS). All four science assessments were developed using selected knowledge and skills statements and student expectations from the science TEKS. The elementary science test was based on eligible science TEKS from grades 2–5. The TAKS is intended to be an equitable and accurate measure of learning for all Texas public school students. A thorough test-development process is used to develop items that are appropriate and valid measures of the objectives and TEKS student expectations the items are designed to assess. TAKS is divided into test objectives that are designed to be identical across grade levels rather than grade specific.

According to the Texas Education Agency (2004), Most items will be in a multiple-choice format with four options. Some multiple-choice items will be written as part of a cluster. A cluster will have a stimulus, which may be a diagram, a brief passage, a chart, or a combination of these, followed by a series of items that will involve the application of prior knowledge and analysis of the given information. Cluster items will appear together on the TAKS test, but items may not always appear on facing pages. A limited number of items will be griddable, requiring students to bubble responses on grids that are the same as those used in the TAKS mathematics tests. The level of precision necessary for an item will be given to the student in the item. A three-column grid is the only type of grid for the Elementary Science—Grade 5 TAKS test. The grade 5 TAKS is a comprehensive elementary assessment. Even though the test is given at fifth grade, it will cover science TEKS from grades 2, 3, 4, and 5 (pp. 4-9).

As mandated by the 76th Texas Legislature in 1999, the TAKS will be administered and measures the statewide curriculum in science at Grades 5,10, and 11; The Spanish TAKS is administered at Grades 3 through 6 (TEA, 2007). All fifth-grade students will be required to take the TAKS elementary science test unless exempted by an admission, review, and dismissal (ARD) committee or a language proficiency assessment committee (LPAC). The elementary science test is available in English and Spanish (Texas Education Agency, 2004, pp. 4-9).

In 2005, Texas boasted a 64% pass rate for the English Science TAKS; only 23% of the fifth grade students passed the Spanish Science TAKS. More elementary

school students failed the science portion of the TAKS test than any other subject (TEA, 2008). According to the *TASB Legislative Report* in May of 2007,

Passing rates are up across the board for students who took the fifth-grade TAKS in English. Seventy-seven percent of the students passed the science TAKS, up from 75 percent in 2006, and 31 percent earned the Commended Performance designation on this exam, which is a seven-point increase. While the passing rate is up four-points on the Spanish science test, it continues to be a trouble spot for this group, with only 35 percent passing the test (p. 2).

In a recent article in the *News*, TEA's press release publication, the state level results for 2008 were revealed:

Along with math and reading, fifth-grade students also take a TAKS science exam, which 81 percent mastered. Thirty-seven percent performed so well on the test that they earned a Commended Performance notation. Among the students tested in Spanish, 35 percent passed the science exam (p. 2).

In analyzing how NCLB fits into the pedagogical picture, a positive aspect is that now bilingual and ELL students are part of the accountability map. On the negative side, as explained by Cummins (2007),

Standardized tests dominate curriculum and instruction; first language literacy is discouraged and undervalued. Reading comprehension is neglected in the junior and intermediate grades, leading to fourth grade "slump." In effect, students don't know what they are reading; there is no focus on the affective sphere or student identity in reading engagement, and for low-income and bilingual/ELL students,

transmission approaches dominate to the exclusion of transformative approaches (p. 16).

How fair is the inclusion of students with disabilities and low levels of English proficiency given the disparities in achievement among subgroups, and the uneven application of consequences? Students generally face more consequences than adults under the new state accountability systems. Stakes are seriously imbalanced, applying more harshly to students than to schools and the adults that work in them. "The adults are somewhat sheltered by the fact that a school is a collective of individuals; consequences are diffused throughout the organization rather than falling on specific individuals, but students bear the brunt of consequences as individuals" (Fuhrman, 2003, p. 4). Stakes fall unambiguously on students, who, unlike the adults who are supposed to be providing them with the opportunity to learn, do not have the means to defend themselves politically.

The accountability debate tends to devolve into a battle between the pro-testing and anti-testing camps. As taken from the wise words of Kane, Staiger & Geppert, When it comes to the design of a school accountability system, the devil is truly in the details. A well-designed accountability plan may go a long way toward giving school personnel the kinds of signals they need to improve performance. However, a poorly designed scheme, which ignores the statistical properties of schools' average test scores, may do more harm than good (p. 1).

When considering revisions to the existing accountability policy, the focus should be on reforming the flaws within the accountability strand that addresses high stakes testing. Rewards and sanctions, although well intended, have produced an array of

harmful consequences. As a result of high stakes testing, some easily identifiable negative outcomes are:

- There is less time spent on content and enrichment.
- Too much money and too many resources are being spent on test-related materials and practice.
- Students are being severely punished for not passing.
- Higher numbers of minority students are tracked into special education.
- The TAKS is not an accurate measure of student growth nor does it reflect value added gains or losses.
- Anomalies can hurt schools with AYP.
- Single measures are not a true reflection of student achievement.
- The existing standards will identify nearly every school as low performing at one point or another.
- There are large fluctuations in scores from year to year.
- The current policy arbitrarily sanctions schools that enroll students from several different backgrounds (i.e. racial, ethnic, socioeconomic).
- The present system of sanctions and rewards is discriminatory to very small or very large schools.
- Subgroups are most strongly impacted especially in graduation rates.
- It propagates a narrowed and/or fragmented curriculum.
- It is not uncommon to find misinterpreted, misreported or misuse of test data.
- The existing policy puts too much weight on single year changes.
- There is a high tendency to have disgruntled and highly stressed teachers.

- Decreased student motivation.
- The definition of AYP often conflicts with state accountability plans.
- Content and enrichment is compromised.
- Public schools are experiencing high teacher turnover rates within schools and grade levels.
- Anxiety and uncertainty amongst students, teachers and administrators.
- Unnecessary improvement plans.
- Inequitable distribution of highly qualified teachers.
- Multiple intelligences are not addressed.

The design of equitable assessments requires the careful consideration of many factors. Research needs to consider the language and culture of students, scientific understanding, and effective assessment practices. As stated by Kane, Staiger & Geppert (2002),

States should be allowed to experiment until the nation finds the ideal way to determine which schools are making adequate yearly progress. We understand the impulse to create a system that requires specific remedies sooner rather than later. However, impatience is an insufficient excuse for bad education policy (p. 6).

The state is eager to create a “Pleasantville” of schools where each day every child in the system ostensibly opens the same book to the same page. The individual needs of the students—slow learners and fast, rural and urban, minority and non-minority— as well as the individual styles of the teachers, have to be subordinated to the neatness of the system. Test scores have come to mean accountability, although they

are different and distinct concepts. They also turn educators into professional accountants, instead of people who are professionally accountable.

On any given day in public schools, it is highly likely that assessment is taking place across all grade levels to help measure student performance and determine where each student's performance falls in the range of assessment outcomes. Testing policies confront many teachers with very practical dilemmas such as figuring out how much time to take out of what he or she wants to teach to prepare students for high-stakes tests, and whether it is possible to continue to teach in ways that promote independent thinking, deeper understanding of concepts, and working together on intellectual tasks when being held responsible for raising students' test scores. Few policymakers consider these daily dilemmas because they see teachers largely as technicians who put into practice what needs to be done.

From his first days in office, President George W. Bush promised to make education reform a centerpiece of his administration, using the reauthorization of the federal Elementary and Secondary Education Act (ESEA) as an opportunity to give the state-led accountability movement a dramatic shove forward. Within six months of his taking office, both houses of Congress had passed bills that imposed new federal standards for the states' accountability efforts (Kane, Staiger & Geppert, 2002).

According to Kane, Staiger & Geppert (2002),

At the heart of both bills was a detailed formula for determining when a school is making adequate yearly progress. The consequences for schools that failed to meet their performance targets were progressively severe—after one year, districts would be required to offer public school choice to all the students in a

school; after several years, districts would be required to replace school staff, convert the school into a public charter school, or hand the school over to a private contractor (p. 1).

Furthermore, both bills would have compounded the error by requiring annual increases in test scores for every racial subgroup in a school (Kane Staiger & Geppert, 2002). The intent was admirable- to ensure that schools do not ignore minority children. But this provision was likely to have harmed its intended beneficiaries, by haphazardly sanctioning schools that enroll students from several different racial or ethnic subgroups. Since African-American and Latino students are more likely to attend schools with more than one racial group, they are more likely to see their education disrupted arbitrarily (Fuhrman, 2003).

Children arrive at school with widely varying levels of preparation. Even a mediocre school can expect high test scores if its students come from wealthy backgrounds. As a result, policymakers in many states have attempted to level the playing field by focusing on improvements in test scores. Another flaw with the existing accountability policy is that factors that lead to fluctuations in performance often produce outcome variations and volatility that can wreak havoc when rewards and punishments are doled out on the basis of changes in test scores. School personnel are at risk of being punished or rewarded for results that are beyond their control.

A quagmire in today's education exists. Proponents of accountability, standardized national curriculum and teacher technicians, ascertain that this philosophy can be successful and that the benefits will be realized in the future. Others argue that just because change is consistent with the technical-rational discourse, it does not

mean it will be successful across the board in a variety of cultural and social settings and even in a particular setting because of the diversity of human beings. It appears that schools are stuck in the modern tradition, with government mandates perpetuating antagonistic social relationships.

States could utilize different models for judging improvement such as looking at changes in performance from one grade to the next for students who were tested in both years. This model is appealing because it holds schools accountable for the value they add; it controls for student background by controlling for student achievement. Even though this approach may not completely eliminate the effect of background factors, such as student access to help at home during the school year, it comes closer than the other approaches (Fuhrman, 2003).

There are also validity concerns questioning whether current measures are put to appropriate use. Many testing experts would fault today's accountability systems on several grounds. Consequences are often applied on the basis of a single measure of mastery, rather than using multiple measures that tap into different ways of demonstrating competence in a content domain. Policymakers often say they are using multiple measures when they provide multiple opportunities to take the same test, but that is not the same as having multiple assessments. Also, the chances of misclassification raise doubts about the application of harsh consequences based on a single test administration. In addition to giving students multiple opportunities to take tests that count for graduation or promotion, some states are averaging scores for schools over a period of years (Fuhrman, 2003).

Significant changes in existing accountability systems, such as increasing the use of multiple measures or assuring that adults bear consequences before students, would be welcomed. Technical information about assessment and accountability systems must be brought to bear when policymakers deliberate accountability systems. If they set requirements for schools to make certain amounts of progress, they need to know if those requirements are feasible, given past performance and likely gains. They also need to know the advantages and challenges of using value-added accountability models as opposed to other models.

Accountability systems should employ different types of data from multiple sources. The weighting of elements in the system, different test content, and different information sources should be made explicit. Accountability systems should include data elements that allow for interpretations of student, institution, and administrative performance. Accountability expectations should be made public and understandable for all participants in the system. Accountability systems should include the performance of all students, including subgroups that historically have been difficult to assess.

Decisions about individual students should not be made on the basis of a single test. Multiple test forms should be used when there are repeated administrations of an assessment. The validity of measures that have been administered as part of an accountability system should be documented for the various purposes of the system. If tests are to help improve system performance, data should be provided illustrating that the results are modifiable by quality instruction and student effort. If test data are used as a basis of rewards or sanctions, evidence of technical quality of the measures and error rates associated with misclassification of individuals or institutions should be

published. Evidence of test validity for students with different language backgrounds and children with disabilities should be made available publicly. If tests are claimed to measure content and performance standards, evidence of the relationship to particular standards or sets of standards should be provided.

Stakes for accountability systems should apply to adults and students. Incentives and sanctions should be coordinated for adults and students to support system goals. Appeal procedures should be available to contest rewards and sanctions. Stakes for results and their phase-in schedule should be made explicit at the outset of the implementation of the system. Accountability systems should begin with broad, diffuse stakes and move to specific consequences for individuals and institutions as the system aligns.

Longitudinal studies should be planned, implemented, and reported, evaluating effects of the accountability program. Minimally, questions should determine the degree to which the system: builds capacity of staff; affects resource allocation; supports high-quality instruction; promotes student equity access to education; minimizes corruption; affects teacher quality, recruitment, and retention; and produces unanticipated outcomes. The validity of test-based inferences should be subject to ongoing evaluation. In particular, evaluation should address: aggregate gains in performance over time and impact on identifiable student and personnel groups.

More data about classroom-level curriculum and instruction would help school users figure out why test scores are at certain levels and assist in deciding what to do about it. Without information about practice, schools are limited in designing remedies

for poor performance. Knowing the variation in opportunity to learn would help policymakers channel additional resources and assistance to needy schools.

Evaluations of accountability systems are essential. Good evaluations would indicate whether students are being appropriately included in assessments, whether assessments have disparate impacts on various groups, whether classroom practice is changing in response to assessment (in ways both intended and not intended), whether it provides remedies for poor performance work, and a host of other equally critical questions. Evaluations will show whether teachers have the ability to do the expected job and whether that capacity is fairly distributed.

Deliberate interventions to improve teacher knowledge and skill, provide extra assistance to students at risk of failure and to build school communities capable of responding to performance pressure are necessary. Further, states and districts need added capacity if they are to assist schools and intervene in instruction. Without investments of this type in capacity, improvements related to accountability systems are likely to be short lived and superficial, and inequities are likely to increase.

#### U.S. Corporatism and Privatization in Curriculum and Testing

School is an inherently youth-centered space, where major aspects of self-identity are engaged both formally and informally, consciously and unconsciously. Thus, the school setting is a central place where the racial/ethnic and social class distinctions and divisions in society are potentially and candidly reproduced. Although the effects may be unintended, the literature indicates an increased profitability and enhanced position of corporations as a consequence of accountability. Educational privatization has a long history in the United States (Murphy, Glimer, Weise & Page, 1998; Rowan,

2001), specifically as it relates to designing and delivering instructional and non-instructional services.

By understanding the relationship of a school district's curriculum to the normative values of the community, a more competent understanding of how a predominately high minority public school district educates their students is gained. The core technologies in schools often resemble the institutionalized norms and values of American society. It can be argued that this close reflection is due to the public school being a tool of Americanization and the institutionalized privilege, which is deeply entrenched and diligently guarded by those who draw advantages from this socio-cultural, class, and color hierarchy. There are creative and underhanded ways of being prevented from improving one's situation, as well as the reality that it is possible for a suppressive economic order to create and maintain poverty for certain individuals in the country. How these privileges are translated into curriculum is the primary question; especially how these translations affect the minority student. Within existing literature, one can find attention paid to the micro effect of privatization on school communities, in particular, the ways in which privatization reforms further exacerbate inequalities related to race, social class, and geographic location (Lipman, 2004; Smith, 2004).

One explanation of how the curriculum in public schools is designed to organize society and maintain itself through the preservation of some of its valued forms of interaction and meaning is in Apple and King's (1977) view of nineteenth-century curriculum developers,

Deeply embedded in their ideological perspective was a "strong" sense of control wherein education in general and the everyday meanings of the curriculum in

particular were seen as essential to the preserving of the existing social privilege, interests, and knowledge of one element of the population at the expense of less powerful groups. Most often this took the form of attempting to guarantee expert and scientific control in society, to eliminate or "socialize" unwanted racial or ethnic groups or characteristics or to produce an economically efficient group of citizens (p. 34).

Racism as it pertains to privilege is for the most part, all that really matters. The dominant party discriminates to demonstrate the impossibility of including the minorities in the community because they are too biologically, socially or culturally different, technically or politically inept, etc. Differences are interpreted to their own advantage and only those differences, such as language or financial resources, which contribute to their argument, are emphasized. The racist can base his argument on a real trait, whether biological, psychological, cultural, or social or even at times an inadequacy. "Of course, the racist far from viewing it as a result of the oppression to which he himself subjects his victim or at least of the objective conditions which the victim is made to endure, holds that inadequacy against him, as if it were a defect or flaw" (Memmi, 1971, p.188). For example, the technical unpreparedness of the recent immigrant or the reduced parent involvement amongst economically disadvantaged minority parents may be the result of their work duties. Research tells us that, among other things, economically disadvantaged parents 1) often work during school hours, 2) have the responsibility for caring for other children or ailing relatives; 3) do not understand their role in their children's education; and/or 4) have haunting memories of their own school experiences that deter them from returning regularly to a school campus (Smith, nd).

As explained by Memmi (1971), the discriminatory process enters the stage of generalization where all of the members of the victimized group are targets for the accusation. Particular forms of racism will not come to an end unless people tackle the social, economic and political structure of our societies.

The policy debate around educational privatization has intensified in the wake of the *No Child Left Behind Act of 2001 (NCLB)* and its explicit incentives for private-sector involvement in schools that fail to make adequate yearly progress (AYP). Across the country, urban school systems are relying on the services and products of specialty service providers to jumpstart compliance with NCLB. These shifts may help some districts to support the more rapid and flexible exchange of data. However, these developments may also serve to detract reforming districts from their commitment to improve teaching for traditionally underserved students and to build collective capacity to sustain changes over time.

Based on industry and district data, three distinct shifts in the content and structure of interactions between suppliers of instructional goods and local school systems can be identified. “These shifts include 1) elevation of test-related services and products, 2) increasing emphases on technology-based solutions and 3) an expanding role for the state in spurring market activity” (Burch, 2006, p. 2582). Researchers have provided evidence of how broader changes are influencing local contracting activities, and the dilemmas and responses generated by these pressures.

Revenues for specialty-service providers have accelerated under NCLB. Local education agencies now spend approximately \$20 billion per year on purchased services and products within the K–12 education market. While historically,

standardized tests have been an important niche within the education industry (Rowan, 2001), products and services demanded under high-stakes accountability reforms have become the fastest-growing segment of the K–12 education market (Stein & Bassett, 2004a, b).

Entrants into the growing market for products and services driven by Federal and local accountability mandates are likely to become pressured to adopt patterns of behavior that emphasize these products and services in order to achieve legitimacy as vendors and obtain needed Federal resources to pay for services. “Four functions are central to the new educational privatization: test development and preparation, data analysis and management, remedial services, and content area-specific programming” (Burch, 2006, p. 2589).

NCLB has helped firms providing test development and test preparation services to make fast inroads into local markets (Stein & Bassett, 2004a, b). NCLB significantly raised the stakes on standards progress by introducing sanctions for schools and districts that fail to make adequate yearly progress. This policy creates increased incentives for districts to assess frequently and early and to identify which students and schools are at-risk. Revenues generated by firms providing test development and test preparation services also appear to have accelerated under NCLB (Burch, 2006).

New products and services related to data analysis and management also have emerged under the new educational privatization. The policy documents of medium to large school districts created a growing demand for data management and analysis products. Under NCLB, states, districts, and schools for the first time are required to report standardized test data by student subgroups. Because nearly every district and

school participates in the Title I program, these mandates have contributed to a higher volume of business for vendors in this area and have encouraged firms to invest in new technology (Stein & Bassett, 2004a, b).

The new educational privatization also has brought expanded opportunities for remedial services. Through these changes, vendors are assuming central responsibility for the education of a newly created category of students- students who fail to perform well on standardized tests (Burch, 2006). A large majority of these low performing students are ELLs. Reflecting this influence, the new educational privatization further elevates the role of standardized tests and test preparation materials to the replacement of best practices.

As stated by Burch (2006), “The significance of these developments- the rise of standardized tests in the district and the de-prioritizing of performance-based assessments- needs to be considered in light of prior research on the effects of high-stakes accountability reforms on children of color and poverty” (p. 2603). Researchers have consistently shown that children of color and poverty are most likely to bear the burden of reforms that elevate standardized assessments over formative assessments (McNeil & Valenzuela, 2001). Under NCLB and the new educational privatization, this condition may worsen as a larger proportion of district funds are consumed by purchasing products and services related to standardized tests.

#### Linguistic and Cultural Understanding Within Science Education

To incorporate students’ home languages and cultures into science instruction, teachers need to develop conceptual understanding about how to articulate science disciplines with student diversity (Lee, et. al., 2007). However, such a task is not simple

and there are few incentives for teachers to make such efforts in the climate of a one-size-fits-all approach to science instruction.

According to the National Center for Education Statistics (1999), in the case of science education, most elementary teachers are not adequately prepared to teach science effectively. Most are also insufficiently prepared to meet the learning needs of linguistically and culturally diverse students (National Center for Education Statistics, 1999). As a consequence of shortcomings in these areas, many teachers have difficulty articulating and linking science content with students' linguistic and cultural knowledge, or even understanding the need to do so. "Science instruction should articulate science disciplines with students' linguistic and cultural experience to make science learning meaningful and relevant, while also promoting English language and literacy development as part of science instruction for English language learners (ELLs)" (Lee, et. al., 2007, p.1269).

In more recent years, the literature has revealed that professional development efforts that consider issues of linguistic and cultural diversity in science education have begun to emerge (Lee, 1999 & Lee, et. al., 2007). Despite successes reported on these professional development efforts, a larger body of literature indicates a multitude of challenges in addressing the intersection between student diversity and science instruction (Lee, et. al., 2007). Many teachers are unaware of linguistic and cultural influences on student learning, do not consider teaching for diversity as their responsibility, purposefully overlook cultural/racial differences, accept inequities as a given condition, or resist multicultural views of learning (Bryan & Atwater, 2002). Also, some just do not see a connection between the teaching of science, perceived by some

as culture-free, and the sociocultural context of teaching. Additionally, most teachers assume that ELLs must acquire English before learning subject matter, although this approach almost inevitably leads these students to fall behind their English-speaking peers (Lee, et. al., 2007).

In order for professional development to address the connection between science education and students' linguistic and cultural diversity, more intensive engagement is required than is usually feasible in projects involving large numbers of teachers. This is especially the case with elementary teachers who have insufficient knowledge of science content and content-specific teaching strategies (Bryan & Atwater, 2002), and therefore are often inadequately prepared to meet their students' learning needs in academically challenging subjects such as science (National Center for Education Statistics, 1999).

Multiculturalist science educators argue for the importance of culturally relevant curriculum materials that recognize diverse cultural perspectives and contributions (National Science Foundation, 1998). "The knowledge base for science-related examples, analogies, beliefs, and practices from a range of cultures is limited" (Lee, et. al., 2007, p.1271). Translations of science material either are sparse or are not as effective and of the same quality because of what is lost in the process. A literal translation frequently does not accurately transfer the meaning of the text and sends a message that one language is valued over the other. Sometimes translation of documents, especially in schools is necessary; however, every effort should be made to originate the documents in two languages simultaneously, from the ground up. This idea presents various challenges to science educators in one-way bilingual and two-way

(dual language) classes because those models call for specific percentages of instruction in all content areas to be addressed in Spanish. Additionally, “developing instructional materials that incorporate linguistic and cultural knowledge may run counter to the desire for standardized materials in large-scale implementation” (Lee, et. al., 2007, p.1271).

These issues are subtle and complex. Helping teachers learn to connect students’ language and culture to science goals and objectives requires a wide variety of supportive structures. In popular culture, as well as in schools, science is portrayed as “objective” and “acultural” (Lee, et. al., 2007). Some teachers, therefore, may feel conflicted, indifferent, or even resistant when it comes to infusing students’ language and culture into their science instruction. It can be presumed therefore that it is more natural to address the content in isolation. Making links between science content and students’ home culture or prior knowledge requires teachers to go beyond the prepared curriculum, and teachers whose own grasp of scientific phenomena is shaky may be less likely to make such creative connections or be unable to do so effectively and in a scientifically accurate manner (Pearl, et. al., 2007).

Equity, a goal of science for all, is critically important with increasingly diverse student populations. According to Lee (1999), traditionally some groups have not performed as well in science and have been underrepresented in science related careers. The groups generally include students from diverse languages and cultures, students with disabilities, students with low socioeconomic backgrounds, and female students (Lee, 1999). Patterns of achievement gaps between these groups and mainstream male students are alarmingly congruent over time and across studies

based on large databases (National Center for Education Statistics, 1999). As Valdes (1996) concluded from her extended research,

For Mexican-origin children in the United States, the fact is that school success has been elusive. Indeed to this day, Mexican origin children continue to fail in American schools in large numbers. By most available measures (e.g., dropout rates, standardized test scores, college enrollment), it is still the case that educational institutions are not meeting the needs of Mexican-origin students” (p. 6).

Again, as the United States becomes an increasingly multi-ethnic nation, the student populations in our public schools are growing more and more diverse. Educators must challenge themselves to see their own teaching assumptions through a culturally different lens-one that ultimately broadens their understanding of their own teaching values and methods. Practicing teachers also need experiences where they explore their own cultural identity, investigate their misconceptions of "others," and embrace the role of empowering students who have been marginalized culturally, economically, and/or linguistically to achieve a status as fully participating members of the classroom community.

### Chapter Summary

While the existing literature is a first step toward a better understanding of fifth grade classrooms and achievement on the science TAKS, it leaves many questions unanswered. Clearly more research is needed to expand the knowledge base on how schools benefit or hinder fifth grade students. In this abridged literature review, several ideas and topics are discussed so as to give the nature of this study some context. The

literature was drawn from various perspectives, including historical perspectives on bilingual education, the accountability movement, and corporatism and privatization in the United States. Also addressed in this chapter are the ideas of culture and social capital, the growth of both minority students and the achievement gap, extensive discussion of the barriers to the education of minority students and finally, the issue of linguistic and cultural knowledge within science education.

What is lacking in the literature is a discussion about science education in culturally and linguistically diverse contexts and educational circumstances such as teacher demographics that hinder instruction and inadequate availability of curriculum that often fail to provide equitable learning opportunities for all students, especially English Language Learners (ELLs). As documented throughout the literature review, several well-known researchers and writers have looked at the school experience for students participating in a bilingual education programs, yet more questions of great importance have arisen and have received little attention. What is the explanation for low passing rates on the science TAKS? What are some of the barriers to effective instruction? It is hopeful that this project will contribute to the literature in these ways.

## Chapter 3

### METHODOLOGY

Chapter three includes a review of the purpose of the study, a description of the participants, and a discussion of the research design and data analysis used in this study. The purpose of this study was to examine the conditions of learning allowing students in one classroom to succeed on the fifth grade science TAKS test while students in other classrooms on the same campus do not succeed. The purpose was driven by the relationship of program models, specifically as it pertains to the influence of language within the content area of science and student performance on the fifth grade science TAKS scores.

#### Subjects and the Selection of Subjects

The units of study for this comparison were placement into one of three program models, which are populated with teachers, who in turn serve students. Both teachers and students provided metrics for comparison and make up the subjects of this study.

According to 2003 data from the U.S. Department of Education's National Center for Education Statistics, the student enrollment for 2007 in both elementary and secondary schools in the United States was projected to be approximately 55 million students, of which about 49 million were estimated to be enrolled in public schools.

In the region where this study was conducted, the Hispanic population is nearly 82% of the population according to the most recent census. The majority of schools in the border area under study also serve a predominantly Hispanic population. It is important to note that there are socioeconomic divisions within the Hispanic population in this area. The schools located on the fringes of the county and in the older central

district are more likely to include minority students who are of lower socioeconomic status than schools in the western area of the county.

The school district under study was West Texas School District (WTSD) whose boundaries encompass fertile farmlands, sprawling desert plains, and five small communities with a total population of approximately 15,000 residents. WTSD served over 5,500 students during the 2007-08 school year. With an annual budget of over \$43 million, WTSD is the largest employer in the community. It employs 410 teachers and 85 educational aides, 275 auxiliary personnel, 18 campus and 11 central office administrators, and 67 professional support staff (WTSD Homepage, 2007).

Today, WTSD maintains five elementary schools, two middle schools, one traditional high school, an early college high school, and an alternative education program. WTSD, as well as all campuses was rated "Acceptable" according to the 2008 State Accountability ratings. Five of the eight campuses missed Recognized status by less than 10 students, and the District missed a Recognized rating by 42 students of the 2,512 students who were tested in the 2007-2008 school year (WTSD Homepage, *Envisions Newsletter*, September, 2007).

Given the literature supporting the importance of context on student achievement, for this study the use of a single school district, with common policies, central office administration, curriculum, and resources provided the best means of controlling for a large number of confounding influences on teacher and student variables and outcomes. In order to ensure a population of statistical significance, all fifth grade classrooms at all of the elementary schools in the school district were the focus of this study. The decision to include both students and teachers in this study was

guided by a desire to maximize any discernable effects of placement in certain program models.

The school district under study had 3,159 pre-K through 5<sup>th</sup> grade students at the end of the 2007-08 school year. Nearly 99% of the 243 elementary teachers who make up this district's faculty were certified and highly qualified as defined and required by the *No Child Left Behind Act*. Elementary school teachers in WTSD had an average of 13 years teaching experience (WTSD Homepage, 2007). WTSD's professional staff on each of its five elementary school campuses included an Instructional Coordinator, Counselor, Registered Nurse, and Librarian. The elementary campuses were rated *academically acceptable* or higher for the past five years. Following is a more detailed description of this study's participants.

The five elementary schools in WTSD fall under the high minority public school category. The district is primarily socioeconomically disadvantaged and comprised of a large percentage of English language learners (ELLs). These ethnic and economic factors only further contribute to the inequity of achievement on the fifth grade science TAKS. The WTSD students were supported through a variety of programs to meet their individual needs including Bilingual Education, Special Education, Advanced Academics, Big Brother/Big Sister, Mother/ Daughter & Father/ Son programs, after school activities, and other programs. WTSD is a participant in the Federal Universal Free Provision II Program; i.e. all students are provided with a free breakfast and lunch regardless of income (WTSD Homepage, 2007).

This study focused on fifth graders in WTSD, in the area of science, during the 2007-08 school year. Statewide, academic achievement of fifth graders on the science

TAKS test is largely unknown because the test is new. On two of the five elementary campuses there were gains on the science TAKS, however there still remained a 39 to 49 point gap between the English and Spanish test takers. Two of the five elementary campuses lost percentage passing points and had a 24-55 point gap. The last elementary campus tested for the first time in the 2007-2008 school year and had a 29 point gap.

In the 2007-08 school year, WTSD offered nine one-way monolingual classes, five two-way bilingual classes, and six one-way bilingual classes in the fifth grade. Of the 24 fifth grade teachers of students whose scores are being analyzed, 21 are female and 3 are male. The teacher population was divided into three groups based on program placement.

In WTSD, students were generally permitted to enter a two-way bilingual class in second grade and below. After second grade, any student enrolled in a two-way bilingual classroom must demonstrate a designated level of proficiency in both languages. When an upper grade student is placed into a two-way bilingual class for the first time, it is typically a function of a teacher or parent recommendation or request. Therefore, a large percentage of the students in the two-way bilingual classes have participated in the program since kindergarten.

Placement into a One-Way bilingual or Straight Monolingual class is primarily based on the student's Home Language Survey results. The one-way bilingual placement can be changed to a straight monolingual placement upon parent denial of bilingual education services or when an ELL student is exited from the bilingual program.

West Texas School District offered elementary school students three models of program placement based on Home Language Surveys, grade level, language proficiency tests and parent permission. In the district under study, a two-way bilingual (often referred to as dual language) classroom model was one in which instruction and instructional materials were offered and presented equally in English and Spanish. The class was made up of a combination of students with English and Spanish native language backgrounds. These students switch between co-teachers who deliver instruction and instructional materials in only English or only Spanish, depending on teacher assignment. Or, students may have one teacher who splits the instruction provided in each language according to the 50/50 model on a daily or weekly basis. This 50/50 model is consistent across all subjects and grade levels. The 2-way bilingual classes were made up of both English dominant and English language learners (ELLs).

Within a Straight Monolingual classroom model, all instruction and instructional materials were in English only, in every grade and every subject (Collier & Thomas, 2002). This group generally consisted of English dominant students. Within a one-way bilingual classroom model, students whose first language was *not* English immediately began learning English based on an acquisition timeline as shown in Table 1. Instruction and instructional materials were in English and Spanish based on grade level and student need. This group can be generalized as ELLs.

Table 1: Distribution of Language Usage in a One-Way Bilingual Class, “90/10” Model

Grade	Spanish Usage (%)	English Usage (%)
Pre-K, K	90	10
1	80	20
2	80	20
3	70	30
4	60	40
5	50	50
6	50	50

The data in Table1 demonstrates how as students’ progress through the grades; the percentage of Spanish usage in the classroom decreases and the percentage of English usage in the classroom increases. This time and treatment differs from the two-way bilingual model where both languages are used equally from Pre-kindergarten on up.

Student achievement data used in this study was limited to that collected from science assessments administered in grade five. The study included 415 fifth grade students who took the TAKS science test in 2007-08. This group consisted of 220 Non LEPs; 120 (59%) LEPs in a 90/10 one-way bilingual class (12 were exited in the 2007-2008 school year); 84 (41%) LEPs in a 50/50 two-way bilingual class (9 were exited in the 2007-2008 school year); and 2 (less than 1%) parent denials in a one-way monolingual class. The group under study consisted of 230 (54%) males and 196 (46%) females. 11 fifth graders who took an alternative assessment were not included.

### Research Design

This study focused on language and its potential relationship to achievement on the fifth grade science TAKS test; therefore, quantitative methods of inquiry were

utilized. This approach allowed for manipulation of multiple variables and kinds of information. Quantitative methods enabled the researcher to collect data in a manner that permitted the theoretical and conceptual framework and additional research questions to emerge directly from the data.

In quantitative research, researchers collect numerical data or information from individuals or groups and usually subject these data to statistical analyses to determine whether there are relationships among them. Quantitative research usually poses hypotheses that are either supported or disconfirmed by the data (Slavin, 2007). Within quantitative studies, research designs can be either experimental or non-experimental. Because relationships between variables will be observed, as they exist without trying to change them, this study is considered to be non-experimental.

To answer the first research question of whether or not there were significant differences in the academic achievement, as measured by the Texas Assessment of Knowledge and Skills (TAKS) tests, of grade five students as a function of program model, this study compared the mean levels of achievement of students served by Straight Monolingual, 50/50 TWB (Spanish component of dual), 50/50 TWM (English component of dual) or 90/10 OWB programs. An analysis of variance (ANOVA) was used to determine the level of significance.

Because it could not be assumed that students were randomly assigned to a particular model, the researcher looked at student demographics to establish if there was reasonably equivalent distribution in the unit of analysis-the classrooms. To address student characteristics and how they were distributed across classroom models, the researcher analyzed and described the percentages of 1) the number of

years students have been schooled in the U.S. and 2) language coding across program models.

To address the question of whether the demographical characteristics of teachers affect student achievement on the science TAKS, the mean levels of achievement of students were compared as a function of teacher characteristics. The teacher characteristics that were categorized were the teachers' area of certification, source of certification, the country or countries the teachers were formally educated in, the language or languages the teachers were formally educated in, the teachers' years of experience, and whether or not there was a match between a student's testing language and the teacher's language(s) of formal education. To determine whether or not teacher characteristics were the same or different based on program model, the categorical characteristics were cross-tabulated with the straight monolingual, 50/50 TWB (Spanish component of dual), 50/50 TWM (English component of dual) and 90/10 OWB programs. An ANOVA was used to determine the level of significance.

To answer the third research question regarding whether or not there were significant differences in the academic achievement on the science TAKS, the mean levels of achievement of students were compared as a function of language of instruction. An ANOVA was used to determine the level of significance.

To answer the fourth research question regarding whether or not there were significant differences in the academic achievement on the science TAKS scores of 5<sup>th</sup> grade students, the mean levels of achievement of students were compared as a function of the language the student tested in. An ANOVA was used to determine the level of significance.

To address the last research question regarding the availability of instructional materials and resources made available by the district in English and Spanish, teachers' responses were analyzed from the teacher questionnaire. Teachers were asked to provide a list of these materials. This finding was purely descriptive in nature based on the questionnaire outcomes.

The researcher described the fifth grade classrooms in the WTSD, and the uses of language in the schooling process. This was a study of language and social organization and how that shapes an understanding of education. Hence, to understand academic achievement in science, data from fifth grade classrooms in WTSD was collected and analyzed. A review of the bilingual/ESL instructional program student profiles identified students' coding, program placement and teacher during the 2007-08 school year. District test data and student information archives were analyzed. No classroom observation or current student data was collected. Teacher characteristics were collected from the online questionnaires completed by the designated 2007-08 fifth grade teachers under study.

The null hypothesis for the comparison of student achievement and program model was that no difference in mean student achievement existed between the students in the different program models. The alternate hypothesis was that a significant difference in mean achievement existed, as determined by the ANOVA. The null hypothesis for the comparison of student achievement and teacher characteristics was that no significant difference existed in teacher characteristics across program models and the alternate hypothesis was a significant difference existed in teacher characteristics across program models, as determined by the ANOVA. The null

hypothesis for the comparison of student achievement and language of instruction was that no difference in mean student achievement existed between the students taught in English or in English and Spanish. The alternate hypothesis was that a significant difference in mean achievement existed, as determined by the ANOVA. The null hypothesis for the comparison of student achievement and student's testing language was that no difference in mean student achievement existed between the students tested in English or in Spanish. The alternate hypothesis was that a significant difference in mean achievement existed, as determined by the ANOVA. Finally, the null hypothesis for the evaluation of instructional materials provided in English and in Spanish was that no difference in availability existed between English and Spanish materials. The alternate hypothesis was that a significant difference in availability existed between English and Spanish materials, as determined through teacher reports.

### Data Analysis

This study was conducted utilizing quantitative methods. Primarily, through a nonexperimental quantitative process, numerical data was collected and subjected to statistical analyses to determine whether there were relationships among variables. Through the use of a correlational design, the researcher was able to learn about many variables at once as well as all of the possible relationships among them. According to Slavin (2007), "Correlational designs have several advantages over experiments. First, correlational designs allow for the study of independent variables over which the researcher cannot have any control" (p. 89). In this correlational study, the "variables are categorical, or discrete variables, which means that they take on a small number of

values (or categories)” (Slavin, 2007, p.87). This correlational study involved categorical data; therefore, each level of the variable was given an arbitrary value.

Quantitative data regarding student demographics and test scores were accessed from school district and Texas Education Agency data sets. Teacher characteristics were identified through the use of an on-line questionnaire, developed by the researcher, distributed to WTSD 2007-08 fifth grade teachers. The Statistical Software Package for the Social Sciences (SPSS) was used to identify correlations among variables to answer the research questions. Responses to the on-line teacher questionnaire helped to assess the availability of instructional science materials in English and Spanish.

The comparison of mean student achievement levels for students served by straight monolingual, 50/50 TWB (Spanish component of dual), 50/50 TWM (English component of dual) and 90/10 OWB was accomplished using an analysis of variance (ANOVA). The ANOVA is particularly appropriate for comparing means between variables (Shadish, Cook, & Campbell, 2002). The use of an ANOVA is also an appropriate method for exploring differences between two or more groups of test subjects. “In ANOVA, a ratio,  $F$ , is used to compare the observed differences to an error term to test hypotheses about differences among groups. The  $F$  employs the variance of group means as a measure of observed differences among groups” (Slate & Juarez, 2006, slide 16). After the statistical comparisons were performed and equivalency was either determined or ruled out, then if the  $F$  value was statistically significant, then calculations of comparisons were conducted to find where differences lay.

Analysis of Variance (ANOVA) procedures were conducted to identify whether any significant differences existed among and between the program model categories that were the focus of this study. Levels of significance,  $p$ , were set at .05 for all analyses. Effect sizes for the ANOVAS are reported using Cohen's (1988) standards: .1 is considered to be a small effect size and of limited practical value; .3 is considered to be a moderate effect size and of moderate practical value; and .5 and above is designated as a large effect size of substantial practical value.

The first correlation was run to find if a relationship between program models (monolingual, one-way bilingual or dual) and fifth grade science TAKS scores existed. An analysis of variance (ANOVA) was used to compare mean TAKS scores of students in the three groups. This statistical method was selected because this analysis includes one dependent variable and three independent variables. Statistical comparisons were performed on the grade five science mean TAKS scores to determine if there is a significant difference in the mean scores among the three program models. Two other independent variables (language of science instruction and students' testing language) were analyzed in this statistical format as well. The Scheffe post hoc comparison method was applied to determine if there is any significant interaction between the groups.

### Ethical Considerations

This study involved the use of historical data. Student names were used only for data processing and categorical classification. The names of students were kept in secure files distinctively separate from the data and did not appear in any report. No data (scores, responses) were identified in study reports by individual names of

subjects. Data were number, letter, or symbol coded for confidentiality. All data that included student names were destroyed at the completion of this study.

Individual teachers who respond to the on-line survey were not identified because the survey was anonymous. In presentation of descriptive data, pseudonyms are used. A letter of informed consent was used, providing written assurances of rights and protections.

Approval to conduct this study was obtained from the Institutional Review Board at the University of Texas at El Paso and WTSD (see Appendix A). All institutional requirements regarding the collection, processing, and storage of data were followed.

### Chapter Summary

Included in this chapter was a description of the research design and methodology for examining the relationship of program model, specifically as it pertains to the influence of language within the content area of science and student performance on the fifth grade science TAKS test. This chapter also contains information on the participants in the study and data analysis procedures to be used to answer the research questions.

## Chapter 4

### RESULTS

In the following section, the findings are presented. This chapter includes a review of the purpose of this study and the results for each research question posed in Chapter 1.

#### Purpose of the Study

The purpose of this study was to examine the conditions of learning allowing students in one classroom to succeed on the fifth grade science TAKS test whereas students in other classrooms on the same campus do not succeed. The purpose is driven by the relationship of program models, specifically as it pertains to the influence of language within the content area of science on student performance on the fifth grade science TAKS scores.

Tables 2 through 7 present information regarding the students and teachers who were the subjects of this study. Table 2 presents data regarding the number of years the subjects under study have been enrolled in U.S. schools by program model.

Table 2: Distribution of Students' Years in U.S. Schools by Program Model

Program Model	Less than 1 Year	1 Yr	2 Yrs	3 Yrs	4 Yrs	5+ Yrs	N
One-Way Bilingual, 90/10 Model	3	1	2	9	4	94	113
Two-Way Bilingual (Spanish component of dual) 50/50 Model	0	4	3	1	1	71	80
Two-Way Monolingual (English component of dual) 50/50 Model	0	0	0	0	0	67	67
Straight Monolingual (English only) Model	0	0	0	0	0	155	155
Total	3	5	5	10	5	387	415

Table 2 shows that more than 93% (93.3%) of the subjects under study had attended schools in the United States for five or more years.

Table 3 shows the distribution of students' language coding across program models.

Table 3: Student Distribution of Language Coding Across Program Models

Program Model	Never-LEP	ELL	Parent Denial	N
One-Way Bilingual, 90/10 Model	0	113	0	113
Two-Way Bilingual (Spanish component of dual) 50/50 Model	0	80	0	80
Two-Way Monolingual (English component of dual) 50/50 Model	67	0	0	67
Straight Monolingual Model (English only)	153	0	2	155
Total	220	193	2	415

Table 3 shows that 53% of the students were coded as never-LEP and 46.5% were coded as ELL.

Table 4 presents the distribution of teachers by years of experience across program models.

Table 4: Distribution of Teachers' Years of Experience Across Program Models

Program Model	< 2 yrs	2-5 yrs	6-9 yrs	10+ yrs	N
One-Way Bilingual, 90/10 Model	1	1	0	3	5
Two-Way Bilingual (Spanish component of dual) 50/50 Model	0	1	4	0	5
Two-Way Monolingual (English component of dual) 50/50 Model	0	1	3	2	6
Straight Monolingual Model (English only)	0	1	0	5	6
Total	1	4	7	10	22

Table 4 shows that in WTSD, more than three-quarters (77.3%) of the fifth grade teachers had six or more years of experience. Forty-five percent of the teachers had ten or more years of experience.

Table 5 presents the distribution of teachers' reported area of certification across program models.

Table 5: Distribution of Teacher Certification Area Across Program Models

Program Model	General Elementary Certification	Bilingual Elementary Certification	General Elementary & Bilingual/ESL Certification	N
One-Way Bilingual, 90/10 Model	0	2	3	5
Two-Way Bilingual (Spanish component of dual) 50/50 Model	0	4	1	5
Two-Way Monolingual (English component of dual) 50/50 Model	2	1	3	6
Straight Monolingual Model (English only)	6	0	0	6
Total	8	7	7	22

As shown in Table 5, teachers in WTSD reported certification areas in General Elementary, Bilingual Elementary, and General Elementary with an additional Bilingual or ESL certificate or endorsement. In the One-Way Bilingual, 90/10 Model, two of the five teachers reported having a Bilingual Elementary certificate and three had both the General Elementary and the Bilingual or ESL certificate or endorsement. In the Two-Way Bilingual (Spanish component of dual) 50/50 Model, four of the five teachers reported having a Bilingual Elementary certificate and one had both the General Elementary and the Bilingual or ESL certificate or endorsement. In the Two-Way Monolingual (English component of dual) 50/50 Model, two of the six teachers reported having a General Elementary certificate; one held a Bilingual Elementary certificate; and three had both the General Elementary and the Bilingual or ESL certificate or endorsement. Finally, in the Straight Monolingual Model (English only), all six teachers reported having a General Elementary certificate.

Table 6 illustrates the distribution of teachers' reported source of certification across program models.

Table 6: Distribution of Teachers' Source of Certification Across Program Models

Program Model	Traditional	University ACP	Region 19 ACP	Other ACP	N
One-Way Bilingual, 90/10 Model	3	1	1	0	5
Two-Way Bilingual (Spanish component of dual) 50/50 Model	3	2	0	0	5
Two-Way Monolingual (English component of dual) 50/50 Model	3	2	0	1	6
Straight Monolingual Model (English only)	6	0	0	0	6
Total	15	5	1	1	22

Table 6 shows that more than two-thirds (68.2%) of the teachers under study participated in a traditional certification program. Of those teachers that participated in an alternative certification program five of seven attended a university ACP.

Table 7 presents the distribution of teachers' reported language of formal education as it compares to the language they are providing instruction in across program models.

Table 7: Instructional Language Comparison Across Program Models

Program Model	Teacher educated in English & provides instruction in English	Teacher educated in Spanish & provides instruction in Spanish	Teacher educated in English & provides instruction in both languages	Teacher educated in both languages & provides instruction in Spanish	Teacher educated in English & provides instruction in Spanish	N
One-Way Bilingual, 90/10 Model	0	0	5	0	0	5
Two-Way Bilingual (Spanish component of dual) 50/50 Model	0	3	0	1	1	5
Two-Way Monolingual (English component of dual) 50/50 Model	6	0	0	0	0	6
Straight Monolingual Model (English only)	6	0	0	0	0	6
Total	12	3	5	1	1	22

As presented in Table 7, teachers' reported language of formal education was compared to their language of instruction. In the One-Way 90/10 Bilingual Model, all five teachers reported having received their formal education in English and are providing instruction in both Spanish and English. In both the Two-Way Monolingual 50/50 Model and the Straight Monolingual Model all teachers were educated in English and are providing instruction in English.

## Research Questions

Research Question #1: *What are the effects of program model (one-way bilingual, two-way bilingual, two-way monolingual, and straight monolingual) on science TAKS scores of fifth grade students?*

Table 8 presents the means and standard deviations of grade 5 science TAKS scores as a function of program model.

Table 8: Means and Standard Deviations of Grade 5 Science TAKS Scores as a Function of Program Model

Program Model	Mean	Standard Deviation	N
One-Way Bilingual, 90/10 Model	2,033.70	196.13	113
Two-Way Bilingual (Spanish component of dual) 50/50 Model	2,136.75	196.30	80
Two-Way Monolingual (English component of dual) 50/50 Model	2,307.46	224.73	67
Straight Monolingual (English only) Model	2,247.94	216.17	155
Total	2,177.78	231.84	415

Table 8 shows that the number of students who were exposed to the models varied from 67 to 155. There was also a difference in mean scores on the grade 5 science TAKS test with a range of 2,034 to 2,307. It should be noted that a minimum score of 2,100 is considered passing and a score of 2,400 and above is recognized as commended performance. Tables 9 and 10 present the statistical comparison of program models.

Table 9: Comparison of OWB to Other Program Models

Program Model	Mean	N	<i>p</i>
One-Way Bilingual, 90/10 model	2,033.70	113	
Two-Way Bilingual (Spanish component of dual) 50/50 Model	2,136.75	80	.000
Two-Way Monolingual (English component of dual) 50/50 Model	2,307.46	67	.010
Straight Monolingual (English only)	2,247.94	155	.000

An analysis of variance (ANOVA) was conducted to determine whether a statistically significant difference was present in grade 5 science TAKS scores as a function of program model. The rationale for conducting an ANOVA as the statistical procedures for this study was that it allows for calculation of effect size. In education, if time or resources are going to be invested into the application of research findings, it is crucial to report the practical applicability, which is verified by the effect size. Initially, measures of skewness and kurtosis were calculated to determine the appropriateness of this statistical method. A statistically significant difference was present,  $F(3, 414) = 33.48$ ,  $p < 0.001$ , in TAKS science scores as a function of program model. The effect size of 0.494 was determined to be moderate to large (Cohen, 1988). Scheffe post hocs were used to ascertain which program model comparisons were statistically significant. Scheffe post hocs revealed that students in the Two-Way Bilingual, Two-Way Monolingual, and the Straight Monolingual programs scored significantly higher on the grade 5 science TAKS test than students in the One-Way Bilingual program.

Table 10: Comparison of TWB Model to Other Program Models

Program Model	Mean	N	<i>p</i>
Two-Way Bilingual (Spanish component of dual) 50/50 Model	2,136.75	80	
Two-Way Monolingual (English component of dual) 50/50 Model	2,307.46	67	.000
Straight Monolingual (English only)	2,247.94	155	.002

As shown in Table 10, the Scheffe post hocs revealed that students in the Two-Way Monolingual and the Straight Monolingual programs scored significantly higher on the grade 5 science TAKS test than students in the Two-Way Bilingual program.

Research Question #2: *What are the effects of teacher characteristics (area and source of certification, years of teaching experience, first language, language of formal education, and country and level of formal education) on science TAKS scores of fifth grade students?*

An analysis of variance (ANOVA) was conducted to determine whether a statistically significant difference was present in grade 5 science TAKS scores as a function of teacher characteristics. Initially, measures of skewness and kurtosis were calculated to determine the appropriateness of this statistical method. No significant differences were found in the mean scores of students as a function of teachers' area of certification  $F(1, 361) = 1.53, p > .05$ , source of certification (e.g. traditional, alternative)  $F(2, 361) = .587, p > .05$ , teachers' first language,  $F(1, 361) = .002, p > .05$ , teachers' language of formal education  $F(2, 361) = 1.55, p > .05$ , or teacher/student language match  $F(1, 361) = .856, p > .05$ .

Tables 11 and 12 present a comparison of the mean scores of students as a function of teachers' country of education and level of formal education.

Table 11: First Comparison of Mean Scores of Students as a Function of Teachers' Country of Education and Level of Education

Country & Level of Formal Education	Mean	SD	N	<i>p</i>
MMUU (K-8 Mexico; 9-12 Mexico; Undergrad U.S.; Graduate U.S.)	2,151.32	222.72	38	
UUUU (K-8 U.S.; 9-12 U.S.; Undergrad U.S.; Graduate U.S.)	2,284.55	220.00	82	.048
UUUN (K-8 U.S.; 9-12 U.S.; Undergrad U.S.; Graduate N/A)	2,150.34	230.42	217	1.000
MMUN (K-8 Mexico; 9-12 Mexico; Undergrad U.S.; Graduate N/A)	2,067.19	175.38	16	.780
MMMUN (K-8 Mexico; 9-12 Mexico; Undergrad Mexico; Graduate N/A)	2,333.56	220.04	9	.280

Table 12: Second Comparison of Mean Scores of Students as a Function of Teachers' Country of Education and Level of Education

Country & Level of Formal Education	Mean	SD	N	<i>p</i>
UUUU (K-8 U.S.; 9-12 U.S.; Undergrad U.S.; Graduate U.S.)	2,284.55	220.00	82	
UUUN (K-8 U.S.; 9-12 U.S.; Undergrad U.S.; Graduate N/A)	2,150.34	230.42	217	.000
MMUN (K-8 Mexico; 9-12 Mexico; Undergrad U.S.; Graduate N/A)	2,067.19	175.38	16	.010
MMMUN (K-8 Mexico; 9-12 Mexico; Undergrad Mexico; Graduate N/A)	2,333.56	220.04	9	.982

As shown in Tables 11 and 12, a statistically significant difference was present in the TAKS science scores of 5<sup>th</sup> grade students as a function of teachers' country of formal education and the level of formal education,  $F(2, 361) = 8.02, p < 0.001$ . The effect size of 0.21 was determined to be small (Cohen, 1988). Scheffe post hocs were used to ascertain which country and level of formal education comparisons were statistically significant. Scheffe post hocs revealed that there were significant differences between the scores of 5<sup>th</sup> grade students taught by teachers who were formally educated in Mexico in grades K-12 and the scores of students taught by teachers who were formally educated in the U.S. in grades K-12. Teachers in both

comparison groups received their undergraduate and graduate schooling in the U.S. Students taught by teachers educated in the U.S. in grades K-12 outscored the students taught by teachers educated in Mexico in grades K-12 by 133.23 points.

The other significant difference was between the scores of students taught by teachers with and without a Master's degree who received their formal education in grades K-16 in the U.S. Students taught by teachers with a master's degree outscored students taught by teachers without a master's degree by 134.21 points.

Table 13 presents the mean scores of 5<sup>th</sup> grade students on the science TAKS test as a function of teachers' years of experience.

Table 13: Mean Scores of 5<sup>th</sup> Grade Students on the Science TAKS Test as a Function of Teachers' Years of Experience

Years of Experience	Mean	SD	N	<i>p</i>
Less than 2 yrs	1,947	149.67	15	
2 – 5 years	2,193	240.76	75	.001
6 – 9 years	2,279	163.25	75	.099
10 or more	2,120	233.95	197	.001

As shown in Table 13, statistically significant difference was present in teachers' years of experience  $F(3, 361) = 3.71, p < .05$  with a small effect size of 0.18 (Cohen, 1988). Scheffe post hocs were used to ascertain which comparisons were statistically significant. The students taught by teachers with less than two years of experience were significantly outscored by the students taught by teachers with two to five years experience, six to nine years experience, and ten or more years of experience. It should be noted that the sample size for teachers with less than two years of experience was very small (N=1).

An analysis of the data was conducted based on the responses from teacher surveys of an existing or non-existing language match for 341 total WTSD students. Of

the 226 students who passed the grade 5 science TAKS test in the 2007-2008 school year, only 29 students (13%) did not share a match between the student's testing language and the teacher's language of formal education. Of the 341 students, 115 students did not pass the grade 5 science TAKS in the 2007-2008 school year, and 51 of those students (44%) did not share a match between the student's testing language and the teacher's language of formal education.

Research Question #3: *What are the effects of the language of science instruction (English, or English and Spanish) on science TAKS scores of fifth grade students?*

The data available does not allow a clear and unambiguous response to this question. As indicated on Table 8 (p. 106), there are obvious differences in performance among students participating in One-Way and Two-Way bilingual instruction. Two-Way Monolingual outperforms Two-Way Bilingual who outperform One-Way Bilingual. These differences were statistically significant. The difference between Two-Way Monolingual and Straight Monolingual were not significantly different although mean performance of Two-Way Monolingual students is greater than Straight Monolingual.

Table 14 presents the means and standard deviations of grade five science TAKS scores as a function of the language of science instruction. This table aggregates One-Way and Two-Way students into a single category. Doing so, allows comparisons between Straight Monolingual and all forms of bilingual programs but also obscures performance differences between One-Way and Two-Way program models.

Table 14: Means and Standard Deviations of Grade 5 Science TAKS Scores as a Function of Language of Science Instruction

Language of Instruction	Mean	Standard Deviation	N	<i>p</i>
English instruction only	2,247.94	216.171	155	.000
English & Spanish instruction	2,135.95	231.147	260	

A one-way analysis of variance (ANOVA) was conducted to determine whether a statistically significant difference was present in TAKS science scores as a function of language of instruction. Measures of skewness and kurtosis were calculated to determine the appropriateness of this statistical method. A statistically significant difference was present,  $F(1, 414) = 23.91, p < .001$ , in TAKS science scores as a function of language of instruction. The effect size of 0.241 was determined to be small (Cohen, 1988). Scheffe post hocs were not reported because fewer than three groups were present. Students who were instructed in English-only scored significantly higher on the grade five science TAKS test than did students who were instructed in English and Spanish. In the context of other data presented, it would be incorrect to conclude that Straight Monolingual programs are superior to all forms of bilingual program models.

Research Question #4: *What are the effects of the language of the test (English, Spanish) on science TAKS scores of fifth grade students?*

Table 15 presents the means and standard deviations of the grade five science TAKS scores as a function of the language in which the test was administered.

Table 15: Means and Standard Deviations of Grade 5 Science TAKS Scores as a Function of Test Language

Language of TAKS Test	Mean	Standard Deviation	N	<i>p</i>
English	2,244.23	223.406	263	.000
Spanish	2,062.80	199.420	152	

A one-way analysis of variance (ANOVA) was conducted to determine whether a statistically significant difference was present in TAKS science scores as a function of the language in which the test was administered. Measures of skewness and kurtosis were calculated to determine the appropriateness of this statistical method. A statistically significant difference was present,  $F(1, 414) = 68.63, p < .001$ , in TAKS science scores as a function of test language. Scheffe post hoc tests were not reported because fewer than three groups were present. The effect size of 0.41 was determined to be moderate (Cohen, 1988). Students who took the grade five science TAKS test in English scored significantly higher than students who took the test in Spanish. It should be noted that the mean score of students who took the grade five science TAKS test in Spanish was below the 2,100 pass rate.

Research Question #5: *What is the availability of instructional science materials provided to West Texas School District (WSTD) fifth grade students in English and Spanish?*

To determine the availability of instructional science materials provided to WTSD fifth graders in English and Spanish, the responses of teachers to the following survey questions were analyzed based on a rubric regarding *type of resource* developed by the researcher.

- What ENGLISH instructional materials and resources are made available to you by the district/campus to use for science instruction?
- What SPANISH instructional materials and resources are made available to you by the district/campus to use for science instruction (This should not include translated materials from materials provided in English- only materials authentically created in Spanish)?

Table 16 presents the teachers' responses to the questions noted above.

Table 16: Instructional Materials Provided in WTSD for Grade 5 Science

Instructional Material/Resource	Type of Resource	Available in English	Available in Spanish
FOSS Kits	Hands-on	Yes	Yes
Science Textbook by Houghton Mifflin	Textbook	Yes	Yes
Forde Ferrier Content, Vocabulary & Practice	Workbook/Assessment	Yes	Yes
AIMS	Hands-on	Yes	Some
Sciencesaurus	Vocabulary Development	Yes	No
Measuring Up to the TEKS	Test Prep/Practice	Yes	No
Keep on Reading	Literature	Yes	No
Discovery Education/United Streaming	Web Resource	Yes	Some
Kamico	Test Prep/Practice	Yes	Yes
Diccionario de Ciencias	Vocabulary Development	No	Yes
Science Vocabulary Cards by Mentoring Minds	Vocabulary Development	Yes	Yes
TMSDS	Online Test Practice/Assessment	Yes	Some
CISD Scope & Sequence (Bundles)	Curriculum Guide	Yes	Some
TAKS Workbook	Test Prep/Practice	Yes	Yes
TAKS Study Guide	Test Prep/Practice	Yes	Yes
TAKS Coach	Test Prep/Practice	Yes	No
Webquest	Web Resource	Yes	Some
Library Books	Literature	Yes	Some
Movies	Technology Resource	Yes	Some
Science Lab Equipment & Models	Hands-on	Yes	Yes
Hands-on Science (all 4 science strands)	Hands-on	Yes	No
Blast Off	Literature	Yes	No
Reading Through Science by McReal	Literature	Yes	No
Loose in the Lab	Hands-On	Yes	No

Table 16 reveals that for the most part, instructional materials in both English and Spanish are available to WTSD teachers with the exception of science content literature, which is not reported to be available in Spanish. Other materials such as AIMS, TMSDS, Webquest, Discovery Education and United Streaming are available in Spanish but not to the same degree as that which is available in English.

Sciencesaurus, Keep on Reading, Loose in the Lab, Reading Through Science, Hands-On Science, TAKS Coach and Measuring Up were not reported by the teachers to be provided in Spanish, but other similar resources are provided such as Diccionario de Ciencias and Kamico. Varied instructional materials and resources are provided to the teachers in the WTSD to support science instruction. The types of resources available are curriculum guides, textbooks, hands-on and lab activities, workbooks, test prep/practice, literature, web and technology resources, assessment tools and vocabulary development.

## Chapter 5

### DISCUSSION

This chapter includes a summary of the study, conclusions, links to the extant literature, recommendations for further research, and implications for practice including some recommendations on how to strengthen and improve educating the largest minority group in America.

#### Summary

The purpose of this study was to examine the conditions of learning allowing students in one classroom to succeed on the fifth grade science TAKS test whereas students in other classrooms on the same campus do not succeed. The purpose is driven by the relationship of program models, specifically as it pertains to the influence of language within the content area of science on student performance on the fifth grade science TAKS scores.

The following research questions guided this study:

1. What are the effects of program model (one-way bilingual, two-way bilingual, two-way monolingual, and straight monolingual) on science TAKS scores of fifth grade students?
2. What are the effects of teacher characteristics (area and source of certification, years of teaching experience, first language, and language and country of formal education) on science TAKS scores of fifth grade students?
3. What are the effects of the language of science instruction (English, or English and Spanish) on science TAKS scores of fifth grade students?

4. What are the effects of the language of the test (English, Spanish) on science TAKS scores of fifth grade students?
5. What is the availability of instructional science materials provided to West Texas School District (WSTD) fifth grade students in English and Spanish?

Teachers and students selected for this study were all from a minority-majority public school district whose students are primarily socioeconomically disadvantaged and comprised of a large percentage of English language learners (ELLs). Student achievement data used in this study were limited to that collected from science assessments administered in grade five. The sample included 415 fifth grade students who took the TAKS science test in 2007-2008. The teacher population was divided into three groups based on program model. For the purpose of measuring student achievement, the science TAKS scores of students taught by teachers from the three program models were compared.

To investigate the first research question of whether or not there were significant differences in the academic achievement, as measured by the Texas Assessment of Knowledge and Skills (TAKS) tests, of grade five students as a function of program model, the mean levels of student achievement within the three program models were compared using an analysis of variance (ANOVA).

To answer the second research question of whether or not demographic characteristics of teachers affects student achievement on the science TAKS test, the mean levels of achievement of students were compared as a function of various teacher characteristics utilizing an analysis of variance (ANOVA) statistical procedure.

To investigate the third research question of whether or not there are significant differences in the academic achievement on the science TAKS test, the mean levels of achievement of students were compared as a function of language of instruction utilizing an analysis of variance (ANOVA).

To answer research question #4: whether or not there were significant differences in the academic achievement on the science TAKS test, the mean levels of achievement of students were compared as a function of the language in which the test was administered using an analysis of variance (ANOVA) procedure.

The last research question dealt with the availability of instructional materials and resources made available by the WTSD in English and Spanish. Teachers' responses to survey questions were analyzed using a rubric developed by the researcher.

### Conclusions

The following conclusions can be drawn from the results of the study presented in Chapter 4.

1. More than 90% (93.3%) of the students under study had attended schools in the United States for five or more years. There was a relatively equal distribution of students who were coded never-LEP (53%) and ELL (47%).
2. More than three-quarters (77.3%) of the teachers under study had six or more years of teaching experience. These teachers are certified in General Elementary, Bilingual Elementary, and General Elementary with an additional Bilingual or ESL certificate or endorsement. More than two-thirds (68.2%) of the teachers under study participated in a traditional certification program.

3. Students in the TWB, TWM, and the Straight Monolingual programs scored significantly higher on the grade five science TAKS test than students in the OWB program.
4. Students in the TWM and the Straight Monolingual programs scored significantly higher on the grade five science TAKS test than students in the TWB program.
5. Although differences were not statistically significant, mean scores of students in the Two-Way Monolingual program were greater than mean scores of students in the Straight Monolingual program.
6. No significant differences were found in the mean scores of students as a function of teachers' area of certification, teachers' source of certification, teachers' first language, teachers' language of formal education, or teacher/student language match.
7. Students taught by teachers educated in the U.S. in grades K-12 significantly outscored the students taught by teachers educated in Mexico in grades K-12.
8. Students taught by teachers with a master's degree significantly outscored students taught by teachers without a master's degree.
9. The students taught by teachers with less than two years of experience were significantly outscored by the students taught by teachers with 2-5 years of experience, 6-9 years of experience, and 10+ years of experience.
10. Of the students who passed the grade 5 science TAKS test in the 2007-2008 school year, 87% shared a match between their test language and the

teacher's language of formal education. Of the students who did not pass 44% did not share a match.

11. Students who took the grade five science TAKS test in English scored significantly higher than students who took the test in Spanish.
12. Instructional materials in both English and Spanish are available to WTSD teachers with the exception of science content literature, which was not reported to be available in Spanish. Other materials are available in Spanish but not to the same degree as that which is available in English.

#### Links to the Extant Literature

Links can be found between this study and that of a study by Garcia and Baker, ed. (2007), where it was established that the number of limited English proficient students and bilingual programs being implemented are growing much more quickly than materials are being made available and teachers are being trained. Differences among program models in terms of instructional materials available in both Spanish and English and the inconsistency in teacher characteristics such as language matches between the teacher's language of formal education and the language of instruction causes and perpetuates substantial disparities in the quality and extent of availability of educational opportunities.

Equality has been a mantra of American public education since the common school was founded in the 19<sup>th</sup> century (Lufkowitz, 2004). The notion that all citizens are entitled to a free public education in order to gain sufficient knowledge to govern themselves and to contribute to a productive economy is a founding principle of democracy. Over the years, however, Americans have deliberated over what level of

education is sufficient and who is responsible for providing the resources necessary to deliver it. As a result of the disproportionate distribution of resources outlined above, the WTSD bilingual program models, especially the One-Way Bilingual, 90/10 model, fail to provide equality of treatment to all the pupils in the district. Although equal resources per pupil in every district is not educationally sound or desirable because of differing educational needs, equality of educational opportunity requires that all school districts possess an equal ability to provide students with substantially equal opportunities for learning.

The findings of this study bear similarities to those of Thomas & Collier, (2001) who compared the achievement of students taught in Two-Way Bilingual program models and students taught in bilingual programs other than a Two-Way model. The significance of the difference in mean student achievement for students in the Two-Way programs over the One-Way in both studies shared the same results. Comparable to the abovementioned studies on dual language bilingual models, the data from this study demonstrates that students in a Two-Way Bilingual program experience higher academic achievement. When comparing the mean scores between students in a Two-Way Bilingual (50/50 dual) and a One-Way Bilingual (90/10) program, there was a moderate to large statistical significance in favor of the Two-Way Bilingual program. Thomas & Collier (2001) concluded that in the initial stages all programs experience relatively the same performance growth, but after about three years the two-way model students significantly outperform the others.

Another similarity to the extant literature is that there was no statistically significant difference between the performance of students in the Straight Monolingual

program and Two-Way Monolingual program. As documented in numerous sources (Baker & Prys Jones, 1988; Cummins & Corson, 1997), “students educated for part of the day through a minority language do not suffer adverse consequences in the development of academic skills in the majority language” (Cummins, nd, p.2). This pattern emerges among both majority and minority language students across widely varying sociolinguistic and sociopolitical contexts and in programs with very different organizational structures. From these results, it can be predicted that by providing as many Two-Way (dual) programs as possible, the English dominant students will not suffer academically but the English minority students will actually experience higher academic achievement. This could have a potentially positive impact on closing the achievement gap between minority and non-minority students. This may be explained by the outcomes from a study by Lee (1999) that indicated that there are linguistic and cognitive advantages of biliteracy, in that literacy and proficiency in one language promotes cognitive and metacognitive abilities as well as the acquisition of additional languages.

This study raised the issue that perhaps LEP students are exposed disproportionately to teachers with limited proficiency in academic Spanish. Just as restricted and elaborated linguistic codes are referred to as how they relate to lower and middle class individuals (Bernstein, 1971, 1990), many of the same characteristics can be seen in the use of language in delivering academic content in a language that has primarily only been social. An "elaborated" linguistic code is a more formal and verbally flexible use of language (Cummins & Swain, 1987). It emphasizes individual verbal elaboration. The elaborated code has many structural and vocabulary options to allow

and command people to use language to be precise and explicit in what they say. It allows the speaker to clearly differentiate one idea from another. As such it is well prepared for abstraction and is the kind of language needed in academic and professional communication. In the One-Way 90/10 Bilingual model, the large majority of teachers were not formally educated in Spanish, yet had a large majority of students requiring instruction in Spanish and who were held accountable based on a Spanish assessment. According to TEA (2008), the purpose of TAKS in Spanish is to measure if ELLs are learning the Texas Essential Knowledge and Skills (TEKS) curriculum in their own language as they receive academic instruction in Spanish and learn English.

By contrast, the "restricted code" is implicit rather than explicit. This can also be compared to the concept of "BICS" as found in much of the bilingual research (Azzam, 2005; Cummins, 1979, 2000; Cummins & Swain, 1987). BICS is distinguished from the CALPS, also referred to as academic language, in that BICS refers to conversational language that is used in informal social settings and CALPS refers to the language and cognitive skills that are necessary to participate and perform in the mainstream classroom curriculum and on standardized tests. These language skills and concepts are learned and developed within the context of the classroom and cover a variety of subjects. The CALP skills rely on the learners' ability to perform in a cognitively demanding and context-reduced environment. If the distinction between basic interpersonal communicative skills and cognitive academic language proficiency is so important for students, how can it not hold the same importance for teachers and their ability to effectively deliver academic content? Teachers representing a wide variety of experiences, Spanish language proficiency, certification routes and understandings of

second-language acquisition are leading classrooms faced with the challenge of increasing academic language proficiency and content-area knowledge as quickly as possible in order to show positive gains on the state-mandated assessments. Teachers are expected to accomplish that task without a strong Spanish academic language of their own.

A lack of student academic language will affect test scores, especially in science where there is so much technical and high level vocabulary. But when many teachers themselves lack fluency in academic Spanish, it interferes with the ability to provide that technical, high level, academic vocabulary that is present in quality instruction. These claims in the literature are supported by this study's findings that students who shared a language match between their testing language and their teacher's language of formal education experienced higher achievement as measured by the grade 5 science TAKS.

Although it is common knowledge, as demonstrated by this study and many others, that there is an unacceptable gap between students testing in Spanish and students testing in English, the reality remains a matter whose explanation falls in the hands of the students themselves. The economic status, lack of prior knowledge, lower parental involvement, language issues, etc. are how the gap is explained but the educational system continues to perpetuate the likelihood of it remaining the status quo by not fixing the problem. This study reiterates the conclusions established by Hearn and Olzak (1981) and Ryan (1976). In that research, "blaming the victim" refers to social interactions that socialize students to define themselves as the problem, rather than exploring the structural causes for their experiences within the institution.

Functioning in this way offers significant insight into the reproduction of inequality in education. As found in Hearn and Olzak (1981) and Ryan (1976), another ideology that requires students to see their experiences as unique and particularistic, rather than linked to the culture and social structure of education, is referred to as “cooling-out”. Much like “blaming the victim” it is inculcated by a certain detachment from racism and social injustice. The process often begins by defining unequal learning conditions as acceptable and matching one’s expectations to those conditions-not expecting very much, not getting very much, and just accepting it as “that’s the way it is.” Examples of this include the tendency to find in this study and in others, that in schools where bilingual programs exist, there is an unequal access to authentic Spanish materials and resources as compared to English materials and resources, and the teachers who are providing the Spanish instruction are far less likely to be native Spanish speakers than the English teachers being English native speakers. As revealed in this study, and found in a research study by Satterfield, Rincones, Stein & Edens (2005), although the growth of Hispanics in the U.S. has been relatively high and steady, their access and educational attainment is not comparable to other ethnic groups.

Equity, a goal of science for all, is critically important with increasingly diverse student populations. According to Lee (1999), traditionally some groups have not performed as well in science. That is comparable to the findings of this study. Similar to the findings of Fuhrman (2003) that found the failure rates for Hispanics students was more than double that of Whites as of 1998 in Texas, this study concluded that although progress has been made in reducing the achievement gap, testing discrepancies continue to exist. As a whole, this study revealed the mean TAKS score in science for

all WTSD fifth graders was barely passing (M=2,178). The mean for students taking the science TAKS in English was slightly higher (M=2,244) and the mean for students taking the science TAKS in Spanish was significantly lower (M=2,063) than their English counterparts. Repeated failure on standardized tests and experiences of discrimination or isolation may not be everyday occurrences but do leave indelible marks. Taken together, they suggest patterns of interaction with intended and unintended consequences that make it particularly difficult for minority students from working class backgrounds to survive and thrive in school.

The new educational privatization has brought expanded opportunities for remedial services. Through these changes, vendors are assuming central responsibility for the education of a newly created category of students-students who fail to perform well on standardized tests (Burch, 2006). A large majority of these low performing students are ELLs. Based on the findings of this study regarding the test scores of students testing in Spanish, one might assume that the new educational privatization further elevates the role of standardized tests and test preparation materials to the replacement of best practices. In revealing these aspects of public schooling, it is hopeful that a dialogue on school socialization practices that goes far beyond elementary schools will be opened.

#### Recommendations for Further Research

The current study focused on program models and language factors related to student achievement in science. This is the initial stage of a research agenda that will be pursued in the future. Following are the researcher's recommendations for further research:

1. The opportunity exists for further refinement of research questions using an expanded palette of demographic and contextual variables. Additionally, analysis using a hierarchical model, which controls for classroom and/or school level variance may reveal a significant difference with implications for improving science instruction.
2. Additional studies are needed before more profound generalizations regarding the effectiveness of matching students' test language with the teachers' language of formal education, as measured by student achievement, can be made. Further research with this interaction may yield undiscovered findings.
3. Further research should be conducted involving larger samples to compare the performance of students in TWM (English component of dual) and Straight Monolingual program models. Further research between these two groups may yield findings with statistical significance.
4. It is evident there is a need for additional research to increase our understanding about the components, limitations, and impacts of integrating systematic allocation of instructional materials in both English and Spanish; providing academic Spanish instruction for teachers providing instruction in Spanish; and for effectively developing bilingual programs that are based on the models shown to be most effective for student achievement.
5. Further research should be conducted to identify and develop solutions to the multitude of challenges in addressing the intersection between student diversity and science instruction.

6. Studies should be conducted to determine if the teacher characteristics that influence student achievement in science differ in schools that incorporate only a Two-Way (dual language) program model and schools that offer both One-Way and Two-Way programs.
7. Studies should be conducted to determine if the factors found in this study to influence student achievement differ as a function of students' socioeconomic status and/or gender.
8. This study was conducted in the southwest United States on the Texas/Mexico border. Future studies should be conducted in other school districts and in other parts of the country, both in border and non-border communities.

#### Implications for Practice

Given the political climate, the impending national and state elections in November, and the reauthorization of NCLB or another version of the ESEA Act, the opportunity to lead in the drafting of new educational legislation exists. Being informed allows for the best positioning to advocate for highly effective education that will ensure this country's commitment to diversity, democracy and equitable public education for our nation's children.

Educational leaders would be remiss in failing to advocate for "improving teaching and learning for all children; in particular, improving the life chances of the poor and dispossessed" (Cardenas, 1997, p. xi). This study draws attention to the need for increasing social capital for these students, teacher training to include academic language proficiency, stricter guidelines and higher incentives for teachers working with

these populations, and equalizing of the availability of instructional materials and programs serving these populations.

In any research endeavor, there are implications for practice which go beyond the results and conclusions generated. Following are the researcher's recommendations for practice:

1. The most obvious implication of this study stems from the inconsistent distribution of teachers' academic language proficiency among program models. Based on these findings, in the assignment of teachers preference should be given to teachers who are likely to be effective in the designated program model. Also, when making hiring choices and program assignments, it may be beneficial to consider level of schooling and years of teaching experience.
2. School districts and university officials should strongly encourage publishers to provide science materials in both English and Spanish for the benefit of bilingual students.
3. Publishers should be encouraged to develop Spanish materials that are originated in Spanish from the ground up. Additionally, culturally relevant curriculum materials that recognize diverse cultural perspectives and contributions and that incorporate linguistic and cultural knowledge should be developed.
4. The differences in student achievement between English and Spanish test takers uncovered by this study lead one to examine the actual assessment more closely. Most items on the math and science Spanish TAKS are transadapted from English items. The findings of this study suggest that these students may be

more fairly assessed by a test created authentically in Spanish and might gain a benefit from a more cultural and linguistic appropriate designed assessment. It is recommended to develop and refine the test items in both languages at the same time so that both versions have been validated using the same process and similar reasoning.

5. Given what is now known about where there are gaps in allocated resources, it makes no sense to continue to channel funding into privatization and the services and products of specialty service providers to jumpstart compliance with NCLB. Greater positive results may come from a shift in allocation. By spending money on additional materials and needed teacher training, students may experience improved teaching for traditionally underserved students and the ability to build collective capacity to sustain changes over time.
6. The refinement of a value added model of student achievement specific to a given school district requires accurate and plentiful data in order to confidently reveal trends. The large numbers of students and teachers, which are required to make comparisons and conclusions, underscores the need for school districts to keep accurate records not just of student assessment data, but of the connections between students and teachers. Teacher assignments need to be kept along with student achievement data that can be made available to researchers.
7. The ability to generalize findings about teacher characteristics such as area and source of certification and years of experience based on student achievement

would be greatly facilitated by centralized efforts from the state education agency that has the ability to maintain data about both students and teachers.

8. The findings in this study are comparable to many others that communicate the need for a revised testing policy. Alternatives that are worth considering include:
  - The use of portfolios as part of the evaluation criteria
  - End of course exams
  - Weighted systems of measurement
  - Incorporation of the value-added approach
  - Looking at cross-cohort changes
  - Revising the system of rewards and sanctions so that they are issued based on longitudinal data
  - Establishing different thresholds for schools of different sizes and student populations or establishing thresholds closer to the middle of the test score distribution
  - Developing assessment criteria that are based on more than a single measurement
9. Policymakers should not be afraid to modify the accountability system. The opponents of existing policy include not only those who are philosophically against state-directed testing, but many who are concerned about such issues as unequal opportunity to learn, disparate impacts, reliance on single measures, and the harsh consequences for students.
10. A different approach to science instruction is necessary. The construct of science achievement, what K-12 students should know and be able to do in

science, is central to science education reform. It is necessary to analyze current conceptions of science achievement in major reform documents such as science content standards, performance standards and large-scale assessment frameworks and to consider equity implications for science achievement and assessment in the context of standards-based and systemic reform.

11. Increased academic achievement for second language learners must first begin with a well designed and well implemented bilingual program that is consistent throughout the district beginning in the elementary grades. Schools must commit to choosing the best program model to serve all students.

The essentials of a quality bilingual program in schools should include 1) all students learning in two languages, 2) all students acting as both first-language models and second-language learners, 3) teachers who are committed to maintaining the language of instruction during and throughout the assigned time, and 4) the availability of quality classroom materials as well as whole school materials in both languages (Izquierdo, nd).

13. An understanding by school personnel about the development of academic language is essential. School personnel must keep in mind that on average it takes 2-4 years to develop conversational/social language (BICS) in L2 and under optimal conditions, 4-7 years to develop cognitive academic language (CALPS).
14. In order to have a successful bilingual program, teachers must be provided with the professional development, including collaborative master's degree

programs and specialized training for teachers who may lack academic language proficiency, needed to become knowledgeable of first and second language acquisition theory. They have to acquire an equally strong understanding of literacy development in two languages in order to provide experiences to foster biliteracy. In addition, they need to learn about teaching practices that have been proven to foster cooperation and collaboration among students.

15. The research findings and implications confirm that there is a relationship between program model and student achievement. The findings are important for education decision makers at all levels, emphasizing that Two-Way (dual language) models not only make sense but also have implications for student success.

Policymakers should consider this study's recommendations in order to affect the improvement of student performance.

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## Appendix A

**THE UNIVERSITY OF TEXAS AT EL PASO**  
Office of the Vice President for Research and Sponsored Projects  
**Institutional Review Board**  
El Paso, Texas 79968-0587  
phone: 915 747-8841 fax: 915 747-5931

DATE: October 22, 2008

TO: Stephanie Zelenak, B.A., M.Ed.

FROM: University of Texas at El Paso IRB

STUDY TITLE: [95048-1] - The Effects of Program Model and Language on Science  
TAKS Scores Among Fifth Graders

IRB REFERENCE #:

SUBMISSION TYPE: New Study

ACTION: APPROVED

APPROVAL DATE: October 22, 2008

EXPIRATION DATE: October 21, 2009

REVIEW TYPE: Expedited Review

Thank you for your submission of New Study materials for this research study. University of Texas at El Paso IRB has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a study design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This study has received Expedited Review based on the applicable federal regulation.

Please remember that informed consent is a process beginning with a description of the study and insurance of participant understanding followed by a signed consent form. Informed consent must continue throughout the study via a dialogue between the researcher and research participant. Federal regulations require each participant receive a copy of the signed consent document.

Please note that any revision to previously approved materials must be approved by this office prior to initiation. Please use the appropriate revision forms for this procedure.

All SERIOUS and UNEXPECTED adverse events must be reported to this office. Please use the appropriate adverse event forms for this procedure. All FDA and sponsor reporting requirements should also be followed.

Please report all NON-COMPLIANCE issues or COMPLAINTS regarding this study to this office.

Please note that all research records must be retained for a minimum of three years after termination of the project.

Based on the risks, this project requires Continuing Review by this office on an annual basis. Please use the appropriate renewal forms for this procedure.

If you have any questions, please contact Lola Norton at 915-747-8841 or [irb.orsp@utep.edu](mailto:irb.orsp@utep.edu). Please include your study title and reference number in all correspondence with this office.

## Appendix B

## Teacher Demographics Survey

Please answer the following questions to the best of your ability and be as descriptive as possible. This survey is part of a doctoral dissertation research project in partial fulfillment of the requirements for the degree of Doctor of Education. All responses are anonymous and will be kept completely confidential. Your participation is voluntary, however it is highly encouraged and appreciated.

1. What was your teaching assignment during the **2007-2008** school year?

- |                                |                                  |  |                                |                                   |
|--------------------------------|----------------------------------|--|--------------------------------|-----------------------------------|
| 5th grade Two-Way<br>BILINGUAL | 5th grade Two-Way<br>MONOLINGUAL | 5th grade Two-Way<br>DUAL (Self Contained) | 5th grade One-Way<br>BILINGUAL | 5th grade Straight<br>MONOLINGUAL |
| <input type="checkbox"/>       | <input type="checkbox"/>         | <input type="checkbox"/>                   | <input type="checkbox"/>       | <input type="checkbox"/>          |

2. What is your first language?

- English   Spanish   Other
- 

3. How many years of teaching experience do you have?

- Less than 2 years   2 to 5 years   6-10 years   More than 10 years
- 

4. What is your area(s) of certification?

5. By what method and from where did you acquire your certification?

- Traditional University   University ACP   Region 19 ACP   Other ACP
- 

6. In what country or countries were you formally educated from kindergarten to 8th grade?

- |                          |                          |                           |   |                          |
|--------------------------|--------------------------|---------------------------|---|--------------------------|
| United States            | Mexico                   | United States &<br>Mexico | United States &<br>any country other<br>than Mexico | Other                    |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>  | <input type="checkbox"/>                            | <input type="checkbox"/> |

7. In what country or countries were you formally educated from 9th through 12th grade?

United States	Mexico	United States & Mexico	United States & a country other than Mexico	Other
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. In what country or countries did you receive your Bachelor's degree?

United States	Mexico	United States & Mexico	United States & a country other than Mexico	Other
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9. In what country or countries did you receive your Master's degree?

United States	Mexico	United States & Mexico	United States & a country other than Mexico	Other	N/A
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10. In what language or languages were you formally educated?

Primarily English	Primarily Spanish	English & Spanish	Other
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

11. What percentage of science instruction do you provide in **English**?

0%	1- 25%	26-49%	50%	51-75%	76-99%	100%
<input type="checkbox"/>						

12. What percentage of science instruction do you provide in **Spanish**?

0%	1-25%	26-49%	50%	51-75%	76-99%	100%
<input type="checkbox"/>						

13. What percentage of your 2007-2008 students took the science TAKS test in **English**?

0%     
  less than 10%     
  10-25%     
  26-50%     
  51-75%     
  76-99%     
  100%

14. What percentage of your 2007-2008 students took the science TAKS test in **Spanish**?

0%     
  less than 10%     
  10-25%     
  26-50%     
  51-75%     
  76-99%     
  100%

15. What **ENGLISH** instructional materials and resources are made available to you by the district/campus to use for science instruction?

16. What **SPANISH** instructional materials and resources are made available to you by the district/campus to use for science instruction?

## CURRICULUM VITA

Stephanie Zelenak was born in El Paso, Texas to Raul Camarillo and Irene Romo. She graduated from Loretto Academy, in El Paso, Texas in 1992. Stephanie majored in psychology, earning a Bachelor's from the College of Liberal Arts at UTEP in 1997. She earned a Master of Arts in Education with a degree in Curriculum and Instruction in 2005 from the University of Phoenix. In 2006 she joined the doctoral program in Educational Leadership at UTEP. Stephanie was a special education teacher with the Ysleta and El Paso Independent School Districts. She also has presented research at the American Educational Research Association's (AERA) national conference and conducted multiple workshops and staff development training throughout El Paso and Canutillo, Texas. At the time of this research, she worked as an Instructional Coordinator for Canutillo Independent School District.

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