An investigation of English Language Learners' performance on regular content assessments: A study of Kansas ELLs

By

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Abstract

AN INVESTIGATION OF ENGLISH LANGUAGE LEARNERS' PERFORMANCE ON REGULAR CONTENT ASSESSMENTS: A STUDY OF KANSAS ELLS

by

Christina Lee Kitson

Due to the federal No Child Left Behind Act and accountability requirements, English language learners (ELLs) in Kansas are expected to make progress in both content area academic achievement and English language proficiency (ELP), as is measured using the state mandated testing for Title I and Title III. In Kansas this is done using the Kansas English Language Proficiency Assessment (KELPA) and the content assessments created by the Center for Educational Testing and Evaluation (CETE) for Math, Reading, and Science. Using validity theory as the framework, the intention of this study was to analyze the relationship between students' English language proficiency category, as measured by the KELPA, and their scores on the content assessments in Math, Reading, and Science. One goal of the research is to examine the predictive power of English language proficiency on content area assessment scores. Additional demographic variables were added to the analysis to measure their influence on content assessment scores. Multiple regressions and multiple ANOVA analysis were performed on state-wide data for all ELLs in the state of Kansas in 3^{rd} – 11^{th} grade classified as ELLs, who took the KELPA and at least one content assessment in 2010. The results confirm that English language proficiency category positively corresponds to content area assessment score for all skills examined. This means that the lower the English proficiency, the lower the content assessment score. Like previous research, Reading had the strongest connection. Students with exceptionality codes (gifted or learning disabled), the English language proficiency category, and the Number of Years in the U.S., were all found to have significance, on average, at least 70% of

the time Qualifying for Free and Reduced Lunch, Native Language, and Gender were found to be significant between 60% - 70% of the time overall. When two demographic variables were combined and analyzed as a pair, no pair combination was found to be significant more than 70% of the time overall. Total Proficiency Category and Exceptionality Code was the only pair combination that had an overall influence above 60%, with an average of 67% across the skills. Discussion is provided expressing the implications of these findings in regards to validity, as well as specific suggestions for teachers, schools, state education systems, and the federal education system. A final appeal is made to ensure that the assessments used with the ELL population accurately reflect that population's needs, and take into account the issues regarding validity of assessment scores from the ELL population.

Keywords: assessment, NCLB, English language learners, English language proficiency, Title I, Title III, validity theory, Exceptionality, Number of Years in the U.S., Free and Reduced Lunch Program, Native Language, and Gender.

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Chapter 1: Introduction

Introduction to the Problem

As the population of English Language Learners (ELLs) grows in the United States, an increasing numbers of ELLs are entering schools across the country. ELL students are those acquiring the English language as a second or additional language. There is no consistent way to refer to those who are learning English. These students are referred to as ELLs, English as a second language learners (ESL), limited English proficiency learners (LEP), language minority learners (LM), learners of English as a second or other language (ESOL), students from non-English backgrounds, and linguistically diverse students. There is no one standard term for researchers to use when describing these students that is reflected in all literature and government policy for this population. For the sake of this study, the term English Language Learners (ELLs) will be used when referring to this group. According to Samson and Lesauz (2009), the federal government uses "limited English proficiency", but the most commonly used term in the research was English language learner (ELL); for the sake of this study, ELL will be the term used.

Samson and Lesauz (2009) stated that, "…the LM [language minority] population has grown by more than 60% in the past decade, from approximately 3.1 million in the 1994–1995 school year to 5.1 million in the 2004–2005 school year" (p. 149). This expansion prompted Menken and Antunez (2001) to say that half of the teachers in the United States should expect to have ELL students in their classes. There is a consensus in the research that this is the fastest growing group of students in the K-12 system in the United States (Wolf et al., 2008a; Tsang, Katz, & Stack, 2008; Abedi, 2004; Kim & Herman, 2009). According to the National Center for Education Statistics (2012), the number of ELLs in public schools in the United States grew from

8%, or approximately 3.7 million students, in 2000–2001 to 10%, or approximately 4.7 million students, in 2009–2010. ELLs made up between 7 and 14 % of the student population in the state of Kansas in the 2009–2010 school year. Kansas experienced a 5% population growth in ELLs in public schools from the school year 2000–2001 to 2009–2010.

It is safe to say that the size and growth of this group make it a population that cannot be ignored. The United States requires everyone to be given the opportunity to be educated through the Equal Educational Opportunities Act (1974) (Public Law (PL) 93–380) and more recently with the No Child Left Behind Act (2001) (PL 107–110). Numerous court cases and other acts have influenced ELL education in the United States. Perhaps the most influential case is Lau v. Nichols (1974) (414 U.S. 563), where the courts found that ELLs should be treated equally with other students and given the same opportunities to learn, including additional English instruction to facilitate English language acquisition.

Through the NCLB (2001), there are explicit stipulations for assessing all students in the K-12 system. No matter the proficiency or duration of time in the country, all ELLs have to be given assessments. They are given their core content assessments, Title I, from the state as well as an English proficiency assessment, Title III. The English proficiency assessment has to be given to all students identified as ELLs. Students in Kansas are identified by completing a "Home Language Survey" (KSDE, 2014, p. 1). If on that survey a language other than English is mentioned, then the student is identified to take a language proficiency assessment (the specific test is based on their grade level). If the student scores below, "fluent/proficient" (KSDE, 2014, p. 1) in any area, then they are identified as an ELL and referred for services. The States' content assessments are a little different. All students have to take the Math assessment once they reach the third grade, but the other assessments (Reading and Science) can be skipped during the

ELLs' first year in the United States. After the first year, all ELLs are required to take all state assessments like any other student in their grade. The scores from these tests are not used for accountability purposes for the first year (Neill, 2005; Rabinowitz, 2008). This study attempted to determine if it is valid to test all levels of English proficiency among English Language Learners (ELLs) on state-mandated content assessments. This study aimed to show that assessments should reveal students' understanding of content, rather than their understanding of content through the lens of their English proficiency.

A few studies have attempted to show the relationship between language proficiency and standardized content assessment scores, and many show the gap between ELLs and non-ELLs. Studies that focus on English language proficiency and content assessment scores are still rare, and none were found for Kansas, looking at the Kansas English Language Proficiency Assessment (KELPA) and standardized content assessment scores. Lack of research on the validity of using standardized content assessments with all proficiency levels of ELLs, but requiring all students to be assessed made this study important.

Young, Holtzman, and Steinberg (2011) studied how ELLs performed on Math and English language arts tests, based on their status as ELL, former ELL, or non-ELL. For one state, they found that native speakers had the highest mean scores and ELLs had the lowest mean scores. The former ELLs were in the middle. For the second state in their study, they found that former ELLs had the highest mean scores while non-ELLs scores were a little lower. ELLs had the lowest average scores. Young, Holtzman, and Steinberg (2011) also found that ELLs had the highest amount of score variance. This was surprising to them as in previous studies they referenced, ELLs had lower amounts of score variance. They attributed that difference to the similarity of proficiency level (on the lower end of the scale) of the ELLs that were in the study.

Tsang, Katz, and Stack (2008) studied the achievement tests of ELLs and the Re-designated Fluent English Proficient (RFEP). They found that correlations were higher between Reading and Math (story problems) than correlations between Reading and Math (equations). They also looked at how long ELLs were in school, and used that as a measure of how long they had studied English. They found that as the students spent more time in school, they started to meet the national norming sample. There was little difference due to the language background (only one year in their study). Their findings regarding the timeline to learn English support the body of research that it takes five to seven years to learn the language. Tsang, Katz, and Stack (2008) also indicate their results support, "creating more flexible approaches in accountability systems to determine the achievement of ELLs" (p. 20). They go on to call for reforming the process for annual yearly progress.

Beal, Adams, and Cohen (2010) conducted a study investigating performance by proficiency on Math tests by high school students. They conducted a one-way analysis of variance using English language proficiency levels and the Math exam as the dependent variable. They found that non-ELLs and the top two proficiency categories had similar Math scores. Those scores were higher than those of their lower proficiency level peers. Students with higher levels of English proficiency performed better on their Math and problem-solving tests. Beal, Adams, and Cohen (2010) then conducted a regression to see if scores for the subskills of listening, reading, speaking, and writing were predictors for math scores. They did not find any subskill area to be significant, but Reading was close at $p = 0.067$ (p. 67). They state, "A minimum level of reading proficiency is required before improvements in math performance will be observed" (p. 67). Their results suggest that there is a non-linear relationship between math and reading proficiency.

Butler and Castellon-Wellington (2005) examined the relationship between the language proficiency scores of ELLs and their scores on the Stanford 9 reading, language, and math assessments. They looked at the third grade (n = 778) and 11th grade (n = 184) using the categories; English only (EO), fluent English proficient (FEP), and limited English proficient (LEP). By using a multivariate analysis of variance (MANOVA), they found that at the third grade level there was a difference in test scores across all tests based on language performance. They also found that LEP students in this grade performed significantly worse than any other proficiency level on all parts of the Stanford 9 assessments. In eleventh grade, they found that EO students performed the best. They were unable to conduct a MANOVA due to the limited population in eleventh grade, but indicated that the difference in means across the different proficiency levels was significant. Butler and Castellon-Wellington (2005) found that English proficiency scores could account for content score variation, with LEP students constantly performing poorly on content assessments based on their proficiency levels. The higher levels performed significantly better than the lower levels.

It is clear that there is a relationship between ELLs English Language proficiency level and content assessment scores, which is especially pronounced between the highest and lowest proficiency levels. The current research explored the relationship between English language proficiency level and the content assessment scores in Kansas to determine how proficiency level influences content achievement. This study was carried out using data obtained from the state of Kansas Kindergarten-12th grade (K-12) assessment system, which at the time of data collection was contracted through the Center for Educational Testing and Evaluation (CETE) at the University of Kansas. Findings of an analysis of ELL students' performance on the states content

assessments will be reported. The ELLs were divided into proficiency groups based on their scores on the state's English language proficiency assessment, the KELPA.

Background of the Study

The NCLB act mandates that all students be assessed (Abedi, 2001; Albus, Klein, Liu, & Thurlow, 2004; Katz, Low, Stack, & Tsang, 2004; Menken, 2010; O'Conner, Abedi, & Tung, 2012; Rabinowitz, 2008). "All students" includes those classified as ELLs, who are considered a subgroup of the overall population. In much of the previous research related to this population, ELLs are treated as a single subgroup. This approach treats the group as if it were a homogeneous group, when it is not. This approach also focuses on the gap between ELLs and their non-ELL peers (Abedi, 2004; Abedi, Hofstetter, & Lord, 2004; Abedi, Lord, Boscardin, & Miyoshi, 2001; Butler, Orr, Bousquet Gutierrez, & Hakuta, 2000; Katz, Low, Stack, & Tsang, 2004; La Celle-Peterson & Rivera, 1994; McNamara, 2011; Menken, 2010; Neill, 2005; O'Conner, Abedi, & Tung, 2012; Pappamihiel & Walser, 2009; Wolf et al., 2008b). There are obvious differences in language, culture, length of time in the United States, race, and socioeconomic status, to name a few. There is also the issue of language proficiency. All ELLs are required to take a state-level language proficiency assessment every year. If we take two students, one at an advanced level and one that moved into the country one year ago and has been placed at the beginning level, it is expected that they score differently on their content and language proficiency assessments, due to their differing levels of English proficiency. Nonetheless, much of the current research focuses on the gap between ELLs and non-ELLs. This research would put these two students together along with all other ELLs to form the single subgroup of ELLs.

One factor that contributes to making across-state comparisons of the English proficiency level difficult is that each state determines how many proficiency levels they will have and to what scores those levels correspond. While the English proficiency assessment of each state is different, there are certain parts in common for all the states. All ELL students are required to take the test and all students receive a score. In Kansas, the KELPA divides students into four proficiency levels. Another similarity in the tests is that there are certain factors that are mandatory for all English language proficiency assessments. The assessments have to have reading, writing, listening, and speaking; they must assess the academic language of the student, and align with the state's language proficiency and state content standards. Therefore, while all states will have different English language proficiency assessments, there are some common components to the design of the assessment. There are also some similarities in the uses of the assessment. Schools use the data to determine what language services to offer ELLs; they are also required to report students' scores for their school's accountability. While each state may design their own assessment instrument, there are many similarities in both the elements required of the test and the use of the test scores.

The linguistic demands of the content assessments are often beyond the lower level ELL students' capabilities. Testing all proficiency levels with a general assessment, i.e. one not specifically designed for ELLs (Abedi, 2001; Neill, 2005; Pappamihiel & Walser, 2009; Solórzano, 2008), renders the lower proficiency level English students to be placed in a position of disadvantage. A low proficiency student may have excellent math skills but not be able to navigate a math test in English due to the complexity of the language required to complete the test. This brings into question the validity of the content assessments for ELLs. Currently, all ELL students are treated the same way with regard to state-mandated testing. The linguistic

demands of the standardized content assessments are based on academic English that takes longer to master than conversational English, which students are usually more familiar with. Jim Cummins has spent much of his career looking at the various aspects of academic language demands and has suggest that students are often ill prepared for the rigors of high linguistic demand assessments (Cummins, 1980, 1984, & 2008).

Statement of the Problem

Title I, Title III assessments, and accountability programs require that ELLs not only improve their English language proficiency, but also advance their academic knowledge. While content assessments (Title I) were not necessarily normed for this population (Abedi, 2001; La Celle-Peterson & Rivera, 1994; Neill, 2005; Pappamihiel & Walser, 2009; Solórzano, 2008) they count toward school accountability goals. The problem investigated in this research is the validity of using the test scores from ELLs on their content assessments for making decisions that could potentially affect the student, school, district, and even possibly the state. This study intends to show that English language proficiency should be a factor in determining an individual's participation in unmodified state content assessments. By examining the proficiency levels assigned by the KELPA, and by considering how ELLs score on their content assessments, decisions can be made about who is capable of succeeding on regular content assessments and who would benefit from modified or alternative assessment. This relates directly to the validity of the assessments used with ELLs. As proffered by Wolf, Herman, and Dietel (2010), validity is, "the degree to which an assessment system produces accurate information about ELL students' performance and provides a sound basis for policy decision-making" (p. 1). If language proficiency influences the standardized content assessment scores of students, then the validity

of those assessments is in question with ELLs. This information can help, in turn, to inform policy with the aim of serving this population better.

Another facet of looking at ELL test performance is determining if a student's content score can be predicted based solely on English language proficiency. If English language proficiency can predict content scores for ELLs, then modifications to the current practice of testing all language proficiency levels in the same manner can be suggested. This may not be universally expressed over all proficiency levels. Having a better understanding of the results for ELLs will help guide policy for the future in how this population should be tested and even how this "group" should be viewed. Can this "group" be clearly defined as such? Grouping ELLs also leads to the inclusion of demographic variables that may influence content assessment scores.

It is clear from the research that ELLs do not all have the English language proficiency to succeed on content assessments in an unmodified way, but few studies focus on the language proficiency level to demine at what point ELLs become successful on content assessments. In Kansas, no formal study has been conducted to connect the KELPA score to the content assessment score for all areas. Therefore, a study linking the two tests will help provide a better understanding of what language proficiency level is needed in order to succeed on the state content assessments.

Objectives of the dissertation research (purpose of the study)

The purpose of this quantitative study was to test the validity of using standardized content assessments with all levels of English language proficiency. Does higher language proficiency lead to higher content assessment scores? This research relates the English language proficiency level (independent variable) to the content assessment scores (dependent variable). Demographic variables, including language proficiency level (independent variable) are also

used to examine content assessment scores (dependent variable) to see if relationships between test performance and membership in a particular demographic group exist. This research would encourage the implementation of assessments that judge the students' understanding of content, rather than their understanding of content through their English language ability.

This research will help determine a level of language ability that has improved performance on standardized content assessments based on grade level. The quantitative nature of the study allowed the researcher to look at vast amounts of data for the entire state, rather than relying on a single district or area. This will allow the results to be more universally applicable across the state as well as across other states with similar demographics. To determine if an ELL's proficiency level affects their performance on the content assessments, two factors need to be analyzed. The first factor is the level of language proficiency of the student. This information can be acquired from the state's language assessment, the KELPA. The second factor is the student's score on the content assessments, which can be obtained from the state's testing program. With all the test scores, collected analysis can be conducted to determine the extent to which English language proficiency influences content assessments. The inclusion of the demographic variables will help reveal other areas of potential concern relating to validity.

Significance of the Study

This study could help lead to a change in the policy of testing all ELLs regardless of their proficiency level, and including their content assessment scores as part of the school's Adequate Yearly Progress (AYP). If a relationship is found between English language proficiency level and content assessment scores, that relationship can be further analyzed to improve the testing system. This study was aimed at separating the ELL subgroup into those who can show their

content knowledge because their proficiency is adequate, and those whose proficiency level prevents them from demonstrating their understanding of the content.

The group that will benefit the most from this study is the ELL students. No student wants to take a test where failure is certain, or feel that they failed a test they could have passed without language barriers. This study will directly help policy makers reevaluate their policies on uniformly testing all ELL students for content assessments. This study may also guide policy and practice to acknowledge the difference between proficiency levels and their ability to perform on assessments. There has been research on linguistic modification (Abedi, 2007) that reveals the ability to lighten the linguistic load for content assessments, which could be emphasized if language proficiency is found to be a significant factor in content performance. This study aimed at contending that ELLs should be given the same opportunities to demonstrate their knowledge regardless of their English linguistic development.

The need for this study stems from the uniform policy currently in place testing all ELLs on standardized content assessments. The blanket approach to treating all ELLs the same regardless of their proficiency level is another way to place certain ELL students at a disadvantage. If a student does not have the basic language ability to take and pass a test, regardless of content, that student is not benefiting from the process and neither is the school. Due to current structure of accountability, schools with large ELL populations are performing poorly in terms of their yearly progress, which can lead to funding cuts, the loss of jobs, or even building closure. Properly testing students with regard to their language and content ability is critical in making such high-stakes decisions.

Theoretical Framework

The concept of differential validity (Rabinowitz, 2008; Young, 2009) and the test usefulness theory (Bachman & Palmer, 1996) were used to design this study. Differential validity is the idea of judging the performance of ELLs and dividing them into subgroups. This would include research into how the ELL subgroup performs compared to other groups in content assessments (such as non-ELLs), but it would also include how subgroups within ELLs perform (such as separating them by proficiency level or demographic variables, as done in the current research).

Bachman and Palmer (1996) articulated the "test usefulness theory" as six main aspects to evaluate tests on: reliability, which is defined as "consistency of measurement" (p. 19); validity (primarily construct validity), which is defined as "the meaningfulness and appropriateness of the interpretations that we make on the basis of test scores" (p. 21); authenticity which is defined as, " the degree of correspondence of the characteristics of a given language test task to the characteristics of a TLU (Target Language Use) task" (p. 23); interactiveness which is defined as, "the extent and type of involvement of the test taker's individual characteristics in accomplishing a test task" (p. 25); impact, which is discussed in two ways, "a micro level, in terms of individuals who are affected by the particular test use, and a macro level, in terms of the educational system or society" (p. 29–30); and practicality which is defined as, "the ways in which the test will be implemented, and, to a large degree, whether it will be developed and used at all" (p. 35).

For the current research, the focus will be on validity (especially differential and construct), interactiveness, and impact. These areas relate to language proficiency and content assessment scores. To accomplish this, demographic variables that could be potential threats to

within group validity will be analyzed, and the role they could play in the nature of the impact of the test scores. Language proficiency could create construct-irrelevant variance (Abedi, 2005; Bachman & Palmer, 1996; Rabinowitz, 2008; Young, 2009) in content assessments. If language proficiency has an impact on content assessment scores, and that is not part of the construct, then it is a threat to construct validity.

Rabinowitz (2008) provides guidelines for future validity research that helped serve as a foundation for this study. Rabinowitz suggested there were, "standard practice specialized validity studies" (p. 21). These studies can be conducted right now, based on the records that are already required for each state and would pose no threats to the population. He suggests there are two categories in this area: Category I studies (ELL performance on English Language Proficiency [ELP] assessments vs. content assessments), and Category II studies (ELL performance vs. Non-ELL performance on content assessments). The current research is a Category I study. Rabinowitz (2008) indicates that states should be able to predict the content assessment scores of ELLs based on their language proficiency and that as proficiency levels increase, so should content score results. There are three questions that Rabinowitz (2008) suggested as a part of Category I studies, "How strong should the relationship be between ELP level and content mastery?... Should the relationship between ELP levels and content mastery differ by content area?... Should the relationship between ELP levels and content mastery differ by language group (or other demographic indicators)?" (p. 24). These questions helped guide the current research and led to the research questions of this study. Through the lens of validity, we can examine the fairness and impact of using these test scores for decisions about this population.

Research Questions

Do all ELLs perform in the same manner on their content assessments? Does having higher English language proficiency change the outcomes on content assessments? Are there any other demographic variables that change the outcomes of content assessments? One way to answer these questions would be to look at the different levels of proficiency separately and see how they are performing on their content assessments based on their grade. The idea that different proficiency levels might perform differently led to the first research question.

Research Question 1: What are the outcomes of Kansas content area assessments for Mathematics, Reading, and Science for ELLs by language proficiency level?

Hypothesis 1: The performance of ELLs on the content assessments will be influenced by the ELP category. This difference between proficiency categories will be especially pronounced between the lower English Language Proficiency categories and the higher ones (between Beginner and Advanced, Beginner and Fluent, Intermediate and Advanced, Intermediate and Fluent).

To examine the relationship between KELPA proficiency level and content area scores, factors need to be analyzed further. The next research question focuses on how ELLs perform on the content assessments in Reading, Math, and Science based on their language proficiency.

Research Question 2: What are the relative effects of proficiency level on assessment scores across grade levels?

Hypothesis 2: As the cognitive demands on the content assessment increase, i.e. as grade level increases, the number of low language proficiency students not meeting state standards will become more pronounced. If the null hypothesis were used in this

situation, it could be assumed that no difference would be perceptible based solely on proficiency level.

A facet of assessing performance is predicting what students will do. Is there a way to predict students' performance on their content assessments through their proficiency level on the KELPA? This led to the next research question.

Research Question 3: To what extent does the KELPA predict students' scores on content assessments in Math, Reading, and Science?

Hypothesis 3: The scores on the KELPA will not be a predictor of content area scores in Math and Science, but will be in Reading.

Research Question 4: What role do other demographic variables (such as Free and Reduced Lunch, Native Language, Gender, Length of Time in the U.S., or Exceptionality Code) play in student achievement on content assessments for ELLs?

Hypothesis 4: Some variables will reflect a positive relationship with student achievement (Native Language and Length of Time in the U.S.), no relationship with student achievement (Gender), or a negative relationship with student achievement (Free and Reduced Lunch and Exceptionality Code).

Repeatedly administering assessments that a student will fail does not help anyone. In this age of accountability and standardized tests, the learning process may have been left behind. ELLs have to struggle to both learn the language of instruction as well as the materials being covered in that instruction. It is the researchers' contention that testing them in the same manner as non-ELLs is doing a disservice to them. Likewise, testing them with tests that were designed and normed on native speakers does not take into account their unique learning situation. The results of this analysis contains recommendations about the appropriate time to test ELLs with

unmodified content assessments, as well as suggestions to reduce the influence of other factors, with the goal of creating the most valid test possible.

Assumptions and Limitations

An assumption of this study is that every year students will perform similarly on their assessments so that the results could apply to years beyond what the current research specifically looks at. Currently, the research has not tracked longitudinally to see how ELLs improve and change over time. Due to the use of only one years' worth of data, basic assumptions of the initial patterns of performance have been drawn from the results of the proficiency tests.

A limitation of this study is that it extends only to the state of Kansas. Due to the nature of English proficiency assessments, each state has a different assessment. Each state determines its own standards, cut scores, and proficiency levels. This study has only used Kansas data, so it cannot be extrapolated to other states. It may be possible to extrapolate the results to other states that have a similar ELL population. The results can indicate areas of weakness that need to be evaluated in each state's system and overall policy changes that can be made to the system.

Operational Definitions

Comprehension of certain terms is essential to understand the field of language testing. Some of these have already been discussed. As discussed before, English Language Learners (ELLs) are those individuals who are learning English as a second or additional language. The following is a review of the key terms.

English Language Learner (ELL). Students are defined as ELLs if they have a native language other than English, or if there is the presence of another language besides English in their homes, and they are not yet fluent in English as measured by an English language proficiency assessment (KSDE, 2011, p. 4)

English Language Proficiency Assessment (ELPA). ELPA is a measure of the English language proficiency of an ELL in four different domain areas: Listening, Speaking, Reading, and Writing (KSDE, 2015a, para. 1). This is a requirement for Title III.

Kansas English Language Proficiency Assessment (KELPA). ELPA developed by the CETE for the Kansas State Department of Education to measure English language proficiency of ELLs in Kansas as part of the Title III mandate is known as the KELPA (KSDE, 2015c, p. 1).

Social language. It was formerly referred to as Basic Interpersonal Communication Skills (BICS). This is the everyday language of social interactions. This is an informal language and depends more on social interaction for meaning (Cummins, 2008; KSDE, 2011).

Academic language. This was formerly referred to as Cognitive Academic Language Proficiency (CALP). This is the language of classroom instruction and content terms. It is associated with literacy and academic achievement including specialized vocabulary and discourse (Cummins, 2008; KSDE, 2011).

Content assessments. Those assessments dealing directly with a specified content area, including English language arts (ELA)/Reading, Mathematics, and Science to assess students' understanding of content area (Young, Holtzman, & Steinberg, 2011). This is a requirement for Title I.

Summary

In this chapter, a brief background of the ELL population is given and then the issue of ELLs taking content assessments is introduced. The framework of test usefulness and validity theory was discussed to establish the foundation for the study. The goals of this study were discussed related to the issue of the possible relationship between language proficiency and

content assessment scores, and the scope of its influence on the ELLs test scores is determined. Four research questions are laid out to examine possible relationships.

In the following chapter, a review of the literature related to this topic will be discussed, focusing on the validity, interactiveness, and impact of tests for this population, as well as current testing practices and further background of the population. In Chapter 3, the research methodology will be described, including the research design. There is an explanation of the population of the study, the instruments used, the analysis used, and ethical issues of the study. Chapter 4 will contain a description of the analysis of the data and a summary of the conclusions for each research question. Lastly, Chapter 5 will be a discussion of the results, conclusions, recommendations to concerned parties, and limitations and recommendations for the future. The intent of this research study is to add in the understanding of the relationship between English language proficiency in Kansas ELLs and their subsequent performance on mandated content assessments in English Language Arts (ELA)/Reading, Mathematics, and Science. This critical examination of the validity of using the same content assessments with ELLs could help motivate test developers, policy makers, and decision makers to address the issue of language proficiency in their testing plans and development. I hope that this study will facilitate understanding of the validity issues involved in content assessments for the ELL population and how that influences accountability.

Chapter 2: Literature Review

Related Literature

This study stems from the inclusion of ELLs in assessments that are being used for school accountability. The foundation of this study is the idea that all students have the right to receive fair and valid assessments. This includes both English language proficiency assessments as well as general content assessments. It is important to understand that all tests administered to ELLs are in some way measuring their English language ability. It is because of this connection between assessment and language ability that these "large-scale, standardized assessments for ELLs have garnered attention" (Bunch, Shaw, & Geaney, 2010, p. 186).

The first step is to look at the population taking the test. In the United States, ELLs are a growing population with their own needs. According to the National Clearinghouse for English Language Acquisition and Language Instruction Educational Programs (2011), there were approximately 5.3 million ELL students in preK-12 in 2008–2009 in the United States. This accounted for around 10.8% of all public school students. In 1998–1999, there were 3.5 million ELLs in public education, which indicates an ELL population growth of over 50%. In some districts or individual schools, ELLs can account for half of the student population or more. This population needs to be considered when designing and constructing the general education tests required by NCLB (2001) or other mandated state testing.

ELL Proficiency Testing

On top of taking the content assessments, all ELL students are required to take the state's English Language Proficiency assessment and in the state of Kansas, it is called the KELPA. Each state is responsible for creating or acquiring an English language proficiency assessment of their own to use for the purpose of accountability. This is referred to as Title III of the NCLB and

it requires that ELLs show they are making progress in acquiring English language proficiency (Pitoniak et al., 2009). The KELPA has four domains, reading, writing, listening, and speaking. The students receive a domain score as well as an overall composite score that contains a weighted representation of the domain scores depending on grade level.

There are arguably different types of language that ELLs have to learn to succeed on the states' language proficiency assessment. One type is the language that has been referred to as social language or BICS. Social language is the everyday common language used for spoken communication (Cummins, 1984). Alterations made to this theory came from Gee's (1990) "primary discourse", Gibbons' (1991) "playground language" and research from Biber (1985) and Carson (1995) dealing with specific lexical differences in language used in different situations. Cummins' new description of this language is conversational fluency (Cummings 2008) but the idea remains the same, this is the daily conversational language used. Another type of language is academic language or CALP, which is the instructional language and vocabulary used in the classroom (Cummins, 1984; Scarcella, 2003). Again, Cummins made alterations to this definition based on research by Biber (1985), Carson (1995), Gee's (1990) "secondary discourse" idea, and Gibbons (1991) "classroom language" and is now referred to as academic language proficiency (Cummins 2008).

The idea that there are separate types of language to be tested on an English proficiency assessment does raise some concerns. What skills are we really testing on the English language proficiency assessment? How can a student speak English well, but do poorly on the language proficiency assessment? A student may have a good handle on the conversational fluency aspect, but still do poorly on the state's language assessment due to their low level of academic language proficiency. Before the current NCLB legislation that requires academic language proficiency be

tested as well as conversational fluency was enacted, many tests were designed without taking into consideration academic language proficiency. Without considering a students' academic language proficiency, they would be ill prepared for their academic careers in school and their subsequent content assessments.

The NCLB mandates that all state ELP assessments include reading, writing, listening, and speaking, assess a student's academic language proficiency; align with the states language proficiency requirements, and align with the states content standards (Abedi, 2008). This is asking a lot of a proficiency assessment. The issue this study is looking at is the validity of using general content assessments with all ELLs, no matter what their ELP level is. It is generally accepted that it will take 4–7 years to learn English (Hakuta, Goto, & Witt, 2000; Tsang, Katz, & Stack, 2008; Abedi & Herman, 2010). This does not mean that students are fluent at this point, but rather this is the point at which they "overcome the language demands of mathematics word problems in standardized achievement test" (Tsang, Katz, & Stack, 2008, p. 19). Tsang, Katz, and Stack go on to say that in these years, learners are gaining the required language skills to be able to "negotiate in mainstream classrooms" (p. 19). According to Abedi and Herman (2010), this time is "to gain sufficient mastery of academic English to join English-speaking peers in taking full advantage of instruction in English" (p. 725). Yet all ELLs are tested immediately upon arrival (within 30 days of being in a district) in English and within a year in all other grade level content, even though their scores do not influence accountability. Conversational fluency may develop more rapidly, but it is not the only thing being tested. The lower the level of proficiency the student has, the more linguistically demanding the general content assessments may be for them, due to their lower conversational fluency as well as their lower academic language proficiency.

State Assessment of ELLs

Though there is federal law supporting the inclusion and education of ELLs in the public school system, there are also methods of addressing the measurement of the education that these students receive. Currently, in the United States, all students are required to take content assessments for accountability due to the NCLB (2001) Act. This is referred to as Title I of the NCLB, where all students, including ELLs, have to perform in terms of accountability and AYP (Pitoniak et al., 2009). ELLs are required to take the Reading content assessments after one year in the United States, once they reach the third grade. During the first year after arrival, ELLs have the option of taking the Reading content assessment, or using their KELPA score, and they are required to take the Math and Science assessments, though they do not count toward AYP (Pappamihiel & Walser, 2009). The Science assessment for Kansas is required in the fourth and seventh grades and twice in the ninth to eleventh grades for all students.

For ELL students, a content assessment is also a measure of their language ability. Several studies on ELLs have analyzed them as one subgroup (Abedi & Gandara, 2006; Pitoniak et al., 2009; Young, Holtzman, & Steinberg, 2011), but by analyzing ELLs this way they have ignored one of the basic features of the group. This is not a homogenous group of students (Bailey & Huang, 2011). They have different language proficiency levels, content knowledge, formal instruction time, native languages, durations of time in the United States, and many other factors that make members of this population unique. A student's proficiency level in English will be a factor in a student's ability to decode the content on the assessment successfully. The duration of time spent in the U.S. will influence both the knowledge of English and the content.

Linguistic complexity on content assessments

One reason why students might underperform on content assessments, is that they are too linguistically demanding. A student might be capable of complex mathematics, but may not be able to read and understand the directions to answer the question correctly. This illustrates how linguistic complexity could play a role in a student's ability to perform on their content assessments. This affects the reliability and validity of the assessments, "Research clearly has shown that unnecessary linguistic complexity of assessment negatively impacts the reliability and validity of assessment for ELL students" (Abedi & Herman, 2010, p. 725). When looking at standardized content assessments, Abedi and Gandara (2006) had this to say, "Due to the complex linguistic structure of these tests, ELL students' performance outcomes are very likely to be underestimated" (p. 39). There are very real implications that for these tests, not only will ELLs be facing validity and reliability issues related to the linguistic complexity of the assessment during the testing, but they will also face issues related to their placement based on the test results after the assessment is completed.

There are reasons for reducing the effects of linguistic complexity on the test takers and on their placement. Abedi and Gandara (2006) mention,

> "(1) reducing the linguistic complexity of assessment tools helped ELL students to perform significantly better because it reduced the performance gap between ELL and non-ELL, and (2) the process of reducing linguistic complexity of test items did not alter the construct under measurement" (p. 39).

Abedi and Gandara have shown in their research that changing the linguistic load would allow ELLs to be assessed more validly while maintaining measurement of the same construct as the assessment was originally supposed to measure. This would be a way to alter the existing test to be more reliable and valid for our ELLs. This idea is shared by Bunch, Shaw, and Gearney (2010) with the addition of using performance assessments "due to putative reductions in

linguistic demands, performance assessments have also been touted as more valid measures of content learning for ELs" (p. 187). There are many ways to reduce the linguistic complexity of ELL assessments. The goal is to make sure the construct remains unchanged and that the tests reliability and validity with the ELL population are improved, while not altering the reliability and validity of the non-ELL population also being measured by the assessment.

One option discussed through research is that of reducing the linguistic complexity. This goes beyond in-class test accommodations to the idea of linguistic modification in the test design itself. According to Abedi (2007), linguistic modification is reducing the unnecessary linguistic complexity of an item or assessment. This is a uniform and standardized modification made to the assessments, unlike accommodations which depend on those administering the test in each school. Linguistic modification has not only shown improvement for ELLs, but "research indicates that linguistic modification helps performance of other low-performing students, not just ELL students" (Wolf, Herman, & Dietel, 2010, p. 6). This concept allows test developers to ensure that their construct is being measured reliably and validly while making a modification that can improve ELL students' opportunities on assessments.

The performance gap between ELLs and non-ELLs

Standardized tests have two very distinct impacts on K-12 education in the United States. It is a matter of thinking in terms of the school and the students. There are repercussions for both based on a student's performance on a standardized test. Performance on standardized tests can play a role in funding, advancement through grades, placement, etc. Research has already established that ELLs face challenges that their native-speaking peers do not. It is important to look at the performance of ELLs compared to their native-speaking peers. In the CSE Technical Report 663, the authors present different research studies related to this issue. They call it a

performance "gap", referring to the gap between ELLs and native English-speaking students or non-ELLs. Within the first few pages of that study, they contend, "There is a gap between the performance of English language learners (ELLs) and their native English-speaking peers (non-ELLs)" (Abedi, et al., 2005, p. 2). The findings of one of the articles in the report state a very similar idea, "As expected, the LEP (limited English proficient) students in the sample performed less well than the non-LEP students" (p. 47). This idea is echoed through the research presented in this report. One article states that, "The results of analyses comparing ELL and non-ELL students indicated that ELL students performed substantially lower than non-ELL students. This finding is consistent across grade levels, test levels, and across different sites" (Abedi, Leon, & Mirocha, 2000/2005, p. 26). This report is clear in its research presented that there is indeed a gap between ELLs and students not classified as ELL. This is the idea that Abedi and Gandara (2006) presented by suggesting that since ELLs do not have a high command of the English language, their assessment performance is affected by their ability to use and understand the language. Their solution, "both learning and assessment conditions must be addressed to help close the performance gap" (Abedi & Gandara, 2006, p. 37). According to the Center on Educational Policy report, Title I students have decreased the gap and have improved at rates better than their non-Title I peers (CEP, 2011a). Kansas, specifically, witnessed a narrowing of the gap between Title I and non-Title I students (CEP, 2011b).

Research supports the idea of a performance "gap" between ELLs and their native-speaking peers. "Results of these analyses indicated that ELL students generally performed lower than non-ELL students in all subject areas, and particularly so in those areas with more language load" (Abedi, Leon, & Mirocha, 2000/2005, p. 38). Language demand or linguistic

demand is cited as a reason for the low performance of ELLs on standardized assessments and for threats to validity of those assessments with the ELL population.

Language load, linguistic/language demands, linguistic complexity all describe the demands of working in a content area in a second language. The lack of English proficiency of ELLs taking standardized tests, thus affecting their overall test scores, is what leads to the performance gap. This language demand is cited as being a major contributor to the performance gap of ELLs and their non-ELL peers (Abedi & Gandara, 2006; Tsang, Katz, & Stack, 2008; & Abedi, Leon, Mirocha, 2000/2005). Language demands do not affect all areas assessed in the same manner. The more language used in the assessment, the more the impact of the language on the performance of ELLs, which contributes to widening the "gap". Reading has the highest "gap", as it places the most language demand on the ELLs. According to CSE Technical Report 663, "The gap between the performance of ELL and non-ELL students becomes smaller in other content areas where there is less language load" (Abedi, Leon, & Mirocha, 2000/2005, p. 3). They also suggest that math has the smallest gap, "particularly on math items where language has less impact, such as on math computation items" (p. 3). The language demands in an assessment influence the performance of ELL and further separate ELLs from their non-ELL peers.

If language demand influences the scores of students (as research has proven it does), then it is logical to infer that the lower the proficiency of the test taker in English, the lower their scores will be. As an example of that "test items for ELL students, particularly ELL students at the lower end of the English proficiency spectrum, suffered from lower internal consistency" (Abedi, Leon, & Mirocha, 2000/2005, p. 39). Currently, there is little if any research into how

different proficiency groups of ELLs perform on their content assessments. It is through this lens that the present study will focus.

ELL Performance on standardized tests

Students in the United States take content and proficiency tests in English that evaluate their knowledge of the English language and their understanding of the content area, these may be influenced by the students' English proficiency. According to Tsang, Katz, and Stack (2008), "One ongoing controversy has been the use of standardized achievement tests written in English to access the academic performance of English Language Learners" (p. 3). This controversy goes beyond simply the use of these tests to measure academic performance, but also to the construction of the tests themselves. Many standardized assessments are normed using native English speakers, thus possibly carrying a bias against ELLs (Gronna, Chin-Chance, & Abedi, 2000).

Abedi and Gandara (2006) build on this idea by looking at The National Research Council's warning about using tests that were constructed for native English-speaking students with ELLs. Quoting directly from The National Research Council, Abedi and Gandara (2006) say, "If a student is not proficient in the language of the test, her performance is likely to be affected by construct-irrelevant variance" (p. 39). This idea crosses over into test development and good testing practices. It is important that the assessments used to evaluate and place students are accurately measuring what they are supposed to be measuring. It is also important to schools, as they strive to meet AYP that the assessments being used accurately reflect what their students understand of the content. Neill (2005) indicated that AYP is a problem for students who cannot meet the goals because of language requirements.

While considering the performance of ELL students, it is important to note that not all ELLs are the same. In a study by Abedi and Herman (2010), it was found that "lower levels of English language proficiency (lower ELD levels) were associated with lower performance" (p. 729). This suggests going beyond looking at how the test was written and what the construct was, and moves into the performance of the students taking the tests themselves. ELLs perform worse on standardized tests than do their native English-speaking peers (Menken, 2008; Abedi & Herman, 2010). Abedi and Herman go on to say that this is true in, "academic subjects that are high in English language demand" (p. 724). Gronna, Chin-Chance, and Abedi (2000) give us a possible reason why these students score lower, "Studies suggest that English language proficiency may influence student performance on standardized assessments" (p. 3). They go on to say in the same article that, "standardized test scores do not represent the complete spectrum of students learning" (p. 4). These ideas are connected. Language demands may influence ELL students' performance on standardized assessments, "Student language proficiency level is associated with performance on content-based assessments" (Abedi, Leon, & Mirocha, 2000/2005, p. 2). If proficiency is linked to performance on content assessments, then looking at student performance on content assessments through the lens of student language proficiency seems like a natural fit. One aim of this study is to look at the relationship between proficiency and content assessment scores.

When discussing standardized content assessments, it is important to note that, "critics have argued that such tests do not provide an accurate estimate of these students' academic achievements, because their limited proficiency in English interferes with their performance on the tests" (Tsang, Katz, & Stack, 2008, p. 3). The major component of language proficiency that affects students' performance on standardized assessments is their reading skills, "Students' level

of reading proficiency obviously plays a major role in their assessment outcomes since without proficiency in reading, students will have difficulty understanding test questions" (Abedi & Gandara, 2006, p. 38). If students are not able to understand the test question, then their ability to answer is greatly limited. In a test measuring reading this is part of the construct, but in a test for a subject like math, a students' ability to read and understand an item should be less important than their ability to perform the steps required to solve the mathematical problems. A study by Gronna, Chin-Chance, and Abedi (2000) looked at the performance differences in mathematics and reading scores of students who had limited English and those that were native speakers or listed as English proficient. Mathematics was studied because language should have less influence on student performance, while reading was selected because, "assessment performance is necessarily affected by students' language background and English language proficiency" (p. 3).

The research presented so far presents an image of standardized assessments; how "language factors may seriously confound the outcomes of instruction and assessment in content-based areas" (Abedi & Gandara, 2006, p. 39). Content areas are tested using these standardized assessments. Research has proven that this can pose problems for the ELLs taking the assessments. According to Wolf, Herman, and Dietel (2010), even math tests are in a way English language tests for the ELL students, and "the language demands of any test may get in the way of ELL students showing what they know and inappropriately constrain their performance" (p. 5–6). English skills are tested no matter what the test construct is in standardized content area tests. More than just English skills, ELLs may lack other skills in their ability to function in English on these tests. "English language demands of the problem solving subscale affect all students, they have a larger effect on English learners' performance, thus

rendering the tests inaccurate in measuring English learners' subject matter achievement" (Tsang, Katz, & Stack, 2008, p. 2). There is a concern that tests in content areas require too much English language skill for an ELL to successfully navigate, which further broaches the issue of validity; "performance on these tests may reflect the English language abilities of ELL students rather than their knowledge of the content material the tests are designed to measure (e.g., mathematics skills, scientific knowledge, etc.)" (Bailey, 2000/2005, p. 81). These ideas led the researcher to look at English language proficiency as a factor in content assessment performance.

From the research on standardized content assessments, we can see that ELLs are at a disadvantage on these assessments. This group does not have the necessary linguistic background for displaying their knowledge and understanding all content in a fair and equitable way; as Abedi and Gandara (2006) suggest, "unnecessary linguistic complexity may hinder ELL students' ability to express their knowledge of the construct being measured" (p. 39). They go on to say that, "ELL students have historically lagged behind their English proficient peers in all content areas, particularly academic subjects that are high in English language demand" (Abedi & Gandara, 2006, p. 36). This is an important idea. If ELLs are not performing as well as they could due to the test design and implementation of the assessment, rather than their skill and knowledge in the content area, there may be a need to evaluate the test and the testing method itself. This study aims to do that by looking at how English proficiency interacts with content assessment scores.

Test Usefulness

For this study, it is important to look at the basic design of the tests and their use. This foundation comes from Bachman and Palmer (1996) and their model of test usefulness for language assessments. As laid out by Bachman and Palmer in 1996, there are six main aspects to

evaluate tests: reliability, validity (primarily construct validity), authenticity, interactiveness, impact, and practicality. Each of these aspects is important in test design and use and, while they were originally designed for language assessment, they certainly apply to all assessments that ELLs take where the use of English is required.

Reliability. Testing ELLs is not simple. The tests designed and normed for native speakers of English may not be as valid or reliable for this population. Gronna, Chin-Chance, and Abedi (2000) suggest that large-scale standardized assessments are normed nationally using native English speakers could be "biased against students who have limited English proficiency" (p. 3). This means that content assessments that have been normed and created with native-speaking learners in mind may not take into account some of the issues and biases that could be faced by a non-native learner.

Validity. One of the first steps of the process is to look at how we go about validating a test. "The validation process begins with consideration of the construct to be measured, the interpretations that are to be drawn from the test, and the purposes of a test" (Wolf et al., 2008, p. 11). While there has been research on the validity of content assessments for ELLs (Abedi, Leon, Mirocha, 2000/2005; Abedi, & Herman, 2010; Abedi, Lord, Boscardin, Miyoshi, 2001; Bailey, 2000/2005; Bailey, Butler, & Abedi, 2000/2005; Butler & Castellon-Wellington, 2000/2005; Pitoniak et al., 2009; Wolf et al., 2008), as well as appropriateness of accommodations for ELLs (Abedi, 2007; Abedi, Hofstetter, & Lord, 2004; Wolf et al., 2008b); there has been little research into how this group actually performs on their content assessments based on their language proficiency (Albus, Klein, Liu, & Thurlow, 2004; Abedi, 2001). Grouping all ELLs together implies that they are functioning as a group and this is not necessarily the case (Abedi, 2001; Katz, Low, Stack, & Tsang, 2004; Neill, 2005; Wolf et al., 2008a). While ELLs qualify for the

same accommodations on their content assessments (no matter their proficiency level), they certainly have differing ability levels in their knowledge and use of the English language.

Authenticity. Content assessments are, in a way, an authentic task for ELLs. The language instruction that they have received should help them perform better on the content assessments. Content assessments are written in academic language, and while there is an expectation that ELLs will know and understand that language, it is not always possible at grade level. Since content assessments are testing the content, and except for reading, that content is not language, the authenticity of the task is reduced for ELLs.

Interactiveness. If on a content assessment, we are trying to measure a student's content knowledge, then the need to use English – when English proficiency is below a native speaker – is questionable. The test would be measuring language ability (not a test construct) and the content knowledge (a test construct). This could lead students with low proficiencies to perform poorly on a content assessment due to their language ability, rather than their content knowledge. This could also happen if other areas influence student performance, such as demographic variables that are not controlled for in testing.

Impact. Though this population is not homogenous, it does have a similar impact on schools, "ELL subgroups are being left behind and that schools and districts that serve significant proportions of ELLs are less likely to meet their AYP goals and more likely to be subject to corrective action than schools serving fewer ELLS" (Abedi & Herman, 2010 p. 725). If a school has a high population of ELLs then it is more likely to not meet AYP goals. This is not the fault of the ELLs rather it is the fault of the system. If this group is universally underperforming then it might be time to evaluate the performance system:

> "Because ELL students by definition, do not have a strong command of the English language, both learning and assessment are affected by their limited English proficiency,

> and both learning and assessment conditions must be addressed to help close the performance gap" (Abedi & Gandara, 2006, p. 37).

With the current emphasis on assessment, the focus has been on the system and the government mandated acts, such as the NCLB (2001). The most attention has been paid to how these students will perform on assessments, which was brought up in Albus, Shyyan, and Thurlow (2006): "This has occurred largely through the implementation of accountability systems that rely on the assessment of students, including students with disabilities and students learning English as a second or other language…" (p. 1).

Test scores from state content assessments are used for accountability as per NCLB (2001) legislature. Each school is responsible for meeting AYP. Schools with ELLs are held to the same expectations of progress; they have to teach their ELLs the content as well as the language required to show that they know the content on their state's assessment. The problem with this concept is best illustrated by Tsang, Katz, and Stack (2008) "critics have argued that such tests do not provide an accurate estimate of these students' academic achievement because their limited proficiency in English interferes with their performance on the tests" (p. 3). For ELL students, having the knowledge and being able to perform on standardized tests depends on English language ability, and furthermore on their English language proficiency, as well as their ability to understand and utilize their content instruction.

Practicality. If we move past the design of the test and consider the implementation of the tests, this is also fraught with issues for ELLs. When we administer standardized tests, we do so in English with English directions. This leads to other issues, such as "Students' level of reading proficiency obviously plays a major role in their assessment outcomes since without proficiency in reading, students will have difficulty understanding test questions" (Abedi &

Gandara, 2006, p. 38). For those students learning English, just navigating the test itself can be a challenge leading to failure.

While all of these areas are discussed under language test usefulness, the areas that overlap with the current research are validity, interactiveness, and impact. There are many different types of validity and this research will focus on construct and differential. The extent to which language proficiency influences the content assessment score is a measure of the interactiveness of the language proficiency and of the content assessment score. Impact is part of the idea of fairness for this population, as well as societal impact. According to Bachman (2009), test use and validity are linked, and it is important to consider not only how the tests work, but also what impact they have on the population and on society as a whole.

The issue of validity

Validity is related to verifying if the test measures what it claims to measure (Bachman, 2004; Brown & Abeywickrama, 2010; Messick, 1993; van der Walt & Steyn, 2008). An aspect of validity not yet discussed is the, "adequacy and appropriateness of interpretations and actions based on test scores" (Messick, 1993, p. 1). One major threat to validity in using standardized content assessments with ELLs "is the fact that the language demands of the tests may exceed the English language abilities of ELL students" (Bailey., 2000/2005, p. 79). It is because "performance on these assessments may therefore not be an accurate reflection of the content knowledge of ELL students if students are stymied in their efforts to answer questions by the presence of construct-irrelevant language" (Bailey, 2000/2005, p. 79).

Construct validity began as a concept in the 1950's and started out at "congruent validity" (Cakir, 2012, p. 669). Cronbach wanted a process, "where to validate is to investigate" (Cakir, 2012, p. 670). A key part of construct validity is what the interpretation will be and how it will

be made. Current concepts of construct validity include four aspects including: "plausibility of a proposed interpretation or use of test scores…extended analysis of inferences and assumptions…evaluation of the consequences of test uses" (Kane, 2008, p. 328) and, "an integrated, or unified, evaluation of the interpretation" (Kane, 2008, p. 329). Cakir (2012) reports that, "all validity is construct validity" (p. 671).

Brown and Abeywickrama (2010) illustrate the difficult nature of validity by highlighting seven different types of validity: content, criterion-related, concurrent, predictive, construct, consequential, and face (p. 30–36). While there are many approaches to analyzing validity, the importance of validity to testing transcends the approaches used. According to the CSE report, there is an "important national need for determining the validity of large-scale content assessments in English, with students who are in the process of acquiring English as a second language" (Abedi et al., 2005, p. vii). Messick (1993) suggests that validity, "assumes both a scientific and a political role that can by no means be fulfilled by a simple correlation coefficient…" (p. 2). Part of what makes construct validity key in testing research is that there is a "consequential aspect" (Messick, 1993, p. 4). It is clear that validity (and its use and interpretation) is crucial in all forms of assessment. To look at validity as an argument, there needs to be an evaluation of the, "intended interpretation and uses of test scores" (Kane, 2008, p. 329). The relationship between, "the evidence and the inference to be drawn should determine the validation focus" (Messick, 1993, p. 5). In this research, the inference is to look specifically at English language proficiency and if that provides construct-irrelevant variance (Abedi, 2005; Bachman, 2005; Bachman & Palmer, 1996; Bailey, 2000/2005; Rabinowitz, 2008; Young, 2009; Messick, 1993) on content assessment scores. This study also shows differences based on demographic variables within the total ELL subgroup.

The idea of looking at subgroup performance on assessments is called differential validity. Differential validity aims to show that a subgroup's performance is similar and we can interpret it in the same way as other subgroups (Young, 2009). Most studies looking at the gap between non-ELLs and ELLs are differential validity studies. This can also include demographic subgroups (Young, 2009). The main threat to validity for ELLs is that their content assessment scores are based on their English language proficiency rather than their content knowledge. This is an issue of construct validity, specifically the inclusion of construct-irrelevant variance (Bachman, 2005; Rabinowitz, 2008; Young, 2009).

As we begin to think about validity, it is important to remember the steps of the validation process. According to Wolf et al. (2008), we first think about the construct being measured, then the interpretation of the results, and lastly, the purpose of the test. Steps to improve our assessments, and how we interact with this population, are related to the NCLB Act of 2001. Before this Act, there was very little regulation governing how the ELL population was assessed and how those assessments were analyzed. "Many of the pre-NCLB assessments were not based on an operationally defined concept of English proficiency, had limited academic content coverage, were not consistent with the content standards of the states, and had psychometric flaws" (Abedi, 2008, p. 194). Since there have not always been federal guidelines in place, and even today states have individual rights when it comes to testing and assessment, there is a need to ensure that the tests are connected to our curriculum and are germane to the content. "Evidence of *content-relatedness* is concerned with the extent to which the content of the test adequately represents the construct that a test is intended to measure" (Wolf et al., 2008, p. 9). That same article goes on to say, "Alignment studies conducted to examine the relationship between state standards and assessments represent this first type of evidence" (p. 9). Part of

ensuring validity is making sure that the content is aligned with both the standards and the construct of the tests. This idea regarding ELP testing is well summarized by Wolf et al. (2008):

> If an ELL assessment is to be used to evaluate student progress from year to year, the items and tasks must reflect the construct of language proficiency (claim 1), must address state ELP standards (claim 2), must provide a reliable, coherent score of the construct (claim 3), must be comparable from year to year (claim 4), must be sensitive to opportunity to learn (OTL, claim 5) (p. 9).

ELLs must take not only the standardized content assessments but also an ELP assessment. Each state is responsible under the NCLB Act (2001) for "implement[ing] a single, reliable, and valid ELP assessment that annually measures listening, speaking, Reading, writing, and comprehension" (Abedi, 2008, p. 197). To best analyze these ELP assessments, "one can examine the extent to which the content of the ELP test is aligned with the construct of [the] ELP as defined in the state's ELP standards" (Wolf et al., 2008, p. 12). Abedi (2008) echoed this sentiment: "Alignment of ELP assessment content with the states' ELP content standards provides assessments that are relevant to students' academic needs" (p. 195). To ensure the fair assessment of ELLs' English language proficiency, one must utilize valid and reliable assessments and note the role of language in the proficiency assessments themselves. On these assessments, ELLs must transcend the day-to-day language used with peers and teachers, to language based on content and vocabulary appropriate to the area of study. In order to determine the influence of English proficiency on content scores, we need to make an inference (Mislevy, 1994), i.e. take what we know and draw reasonable conclusions regarding what we see.

Assessment accommodations for ELLs

When ELLs take tests, educators make some accommodations for their ability to take a content assessment in a language other than their native tongue. Each state establishes its own accommodations. Researchers have conducted studies on accommodation use in state

assessments. In particular, Abedi and Gandara (2006) found that "the results indicated that of the 73 accommodations used by different states only 11 (or 15%) of them were highly relevant for these students" (p. 40). Part of the reason for the lack of efficiency in accommodations might be the origins of the accommodations themselves. In many cases, educators simply modified accommodations for special education students (Abedi, Hofstetter, & Lord, 2004; La Celle-Paterson and Rivera, 1994; Rabinowitz, Ananda & Bell, 2004; Solano-Flores, 2008; Wolf et al., 2008a). Researchers have found accommodations specifically designed for ELLs more effective: "Results from experimentally controlled studies suggest accommodations that are language-based or consistent with students' language needs are more effective and valid for ELL students than those originally created and proposed specifically for students with disabilities" (Abedi & Gandara, 2006, p. 40). Another aspect of the use of accommodation is that it is, "difficult to design appropriate accommodations to compensate for ELLs' lack of English proficiency, particularly when they are tested in reading/language arts" (CEP, 2010b, p. 2).

In Kansas, ELLs can use the following accommodations: extended time, small group administration, one-on-one administration, directions read aloud in English, test items (most or all) read aloud in English (not available for the Reading test), breaks during the test, a bilingual dictionary (without definition in either language), directions read aloud in the Native Language (Spanish), test items read aloud in Spanish (not available in Reading), and a Spanish version of the test (Math and Science if instruction was in Spanish) (KSDE, 2011). Perhaps, on content assessments, English proficiency could be a criterion for accommodation, as "research evidence supports the use of the length of time students have been instructed in the United States as well as level of English proficiency as valid criteria for decisions regarding appropriate accommodations for ELL students" (Abedi & Gandara, 2006, p. 40–41).

How ELL performance affects schools

There are many ways that standardized testing affects schools and the employees of those schools. Since the NCLB Act was passed, there has been accountability for all schools and teachers, not just those related to ELLs, but to all students and their performance on standardized assessments. The fact that ELLs are included in the accountability of schools after their first year has greatly influenced their importance to schools. "Schools and districts with large populations of ELLs are being labeled as unsuccessful because many students in the process of acquiring English are not able to meet the percent proficient targets" (Tsang, Katz, & Stack, 2008, p. 20). Because ELLs are included in a schools accountability, if a school has a disproportionate number of ELLs their overall school score is affected; this can be especially pronounced in schools or districts that serve high proportions of ELLs (Abedi & Herman, 2010).

Schools that have large populations of ELLs may find that their schools do not perform well on their tests as a whole and fail to meet progress as defined in NCLB (2001). When this happens, teachers may turn to other means to help their students succeed, "ample research shows that administrators and teachers generally tend to respond to strong accountability demands by focusing their efforts on what is expected of students; by aligning curriculum and instruction with standards, and particularly with what is tested" (Abedi & Herman, 2010, p. 726). Teaching to the test occurs with this population (Diamond, 2012), even though teachers are taught to avoid it. It is important to remember that teachers are trained professionals. They go to college and take classes that teach them proper methods and theories for their profession. As the population of ELLs grows, the teachers needing training in working with this population also grows, and some teachers working with ELLs do not have the training to work with this population. "ELLs are more likely than other students to be taught by teachers without relevant teaching credentials and

with little classroom experience" (Abedi & Herman, 2010, p. 725). This population has to overcome many obstacles to perform on standardized tests and often they are aided by teachers who do not know the relevant theories and methods for working with them.

How ELL performance affects students

As schools face repercussions of the test scores of ELLs, the students have many of their own issues. There are issues of test anxiety, cultural background, language proficiency, and exposure to the academic content, to name a few. "Many students in both the United States and countries throughout the world attend schools where they are required to use languages other than those they speak at home" (Bunch, Shaw, & Geaney, 2010, p. 185). This is not a unique problem to the US, but as it is related to the NCLB (2001), there are specific limitations to address regarding the students themselves. "ELL students begin school significantly behind their English-speaking peers and so require extra time and instruction from the very beginning of school to catch up" (Abedi & Gandara, 2006, p. 37). Not only do they have to learn English to learn content and take their assessments, but ELLs are sometimes also behind in the academic content knowledge when they get to school. Even if they are up to date on their content, their limited English skills will slow them down in class (and even sometimes remove them from class in a pull-out situation, where they go to an ELL teacher during a subject class time). "Cultural and linguistic minority students have less exposure to content, and their instruction tends to cover less content relative to nonminority students" (Abedi & Herman, 2010, p. 727). If they have less exposure and less access, how can it be valid and reliable to assess them as everyone else is assessed?

As ELL students are struggling to learn English, they often take some mainstream classes and some special ELL classes. Just because they are in mainstream classes does not mean they

are able to keep up or that their understanding of the content is at the same level as their non-ELL peers, but "subgroups including ELLs have had less access than other students to challenging curriculum that would prepare them for success on today's standards" (Abedi & Herman, 2010, p. 725). ELL students who are struggling with English and with the content of their courses are not being given the same opportunities as non-ELL peers. "Gee (1990) has also pointed out the limitations to academic language acquisition within classrooms because children are often not given sufficient opportunity to use scientific language themselves" (Bailey, 2000/2005, p. 93). Another implication for ELLs due to their limited English skills is that they may be placed into remedial programs, "We know that consistently low test scores often lead to placement in remedial and low-level instruction that further disadvantages already disadvantaged learners" (Abedi & Gandara, 2006, p. 39). This can set them back even further in their education, "students' access to and engagement in the academic content and their need to perform well on tests and achieve standards—looms large as a possible barrier to the success of ELLs" (Abedi & Herman, 2010, p. 726). ELLs have a lot to overcome during their time in school. Their performance on both content and proficiency assessments might change their placement in classes, access to services, and have psychological effects as well.

Repercussions for test development

The system for assessment of ELLs currently in place holds many opportunities for improvement. It is important for test developers to continue working with these assessments taking heed of the advice of the researchers in this area. There are many suggestions in the research for changes or alterations in the current practice of test development for the ELL population.

One step is to look at the area of accommodations and perhaps try to rethink how we use them, and "designing assessments that are accessible to the greatest number of students possible could reduce the need for accommodations" (Wolf, Herman, & Dietel, 2010, p. 9). If assessments can be designed with ELLs in mind, it could help all students perform better on the assessments while still measuring the construct being assessed. This could be, in part, to make sure the linguistic complexity or language demands on the assessment are appropriate to the construct, and do not add undue complexity to the language, which could impair the performance of ELLs. "The notion of identifying a threshold of language proficiency is still viable with a test that provides a clear indication that the language complexity of the content assessment is not a barrier to student performance" (Bailey, Butler, & Abedi, 2005, p. 105). Another idea is to create a more flexible system for accountability when looking at the ELL population (Butler & Stevens, 2001; Gottlieb, 2003; Kim & Sunderman, 2005; McKay, 2005; Tsang, Katz, & Stack, 2008). By creating a more "flexible approach" to accountability and working harder to evaluate the achievement of the ELLs, a more effective system could be created.

Abedi and Gandara (2006) found that ELLs had a "deficit in syntactic awareness skills" and they suggest that "test makers would do well to reduce syntactic complexity in test items that will be used for ELL students" (p. 38). They state in that same article that ELLs may need more time to learn reading skills than their non-ELL peers and that test makers "must be cognizant of these factors when developing, administering, and scoring test items for ELL students" (p. 38). Wolf, Herman and Dietel (2010) also make suggestions for the design of materials for content assessments of language characteristics, and "several principles including the use of high frequency words, avoiding colloquial and double-meaning words, and reduction of unnecessary expository materials for mathematics assessments" (p. 9). These modifications might assist ELLs

in expressing their understanding of content materials, which should led to more reliable and valid assessments for this population.

Conclusion

If language demand impacts students' scores as the research has shown, then it is logical to infer that the lower the proficiency of the test taker in English, the lower their scores will be (Abedi & Herman, 2010; Abedi, 2005; Albus, Klein, Liu, & Thurlow, 2004; Katz, Low, Stack, & Tsang, 2004; Solórzano, 2008; Young, Holtzman, & Steinberg, 2011). Currently, there is little research directly into how different proficiency groups of ELLs perform on their content assessments. "The previous work did not include independent measures of language skills but rather looked at student performance on content measures by district- or state-designated language categories such as LEP/non-LEP and bilingual/non-bilingual" (Butler & Castellon-Wellington, 2000/2005, p. 48). This line of inquiry could dramatically change how ELLs are assessed in the future. Wolf, Herman, and Dietel state, "There is also limited empirical research on the assessment and instructional needs for ELL students at different levels of English proficiency" (Wolf, Herman, & Dietel, 2010, p. 10).

The current research examines the important concept of the English language proficiency of ELLs, and its relationship with, or influence on content assessment scores. If there is a point of proficiency where the test results are valid, the way we administer and interpret standardized content assessments could be altered. If there are other options for administering tests, we should analyze them:

> An important consideration underlying the research reported here was the goal of identifying and/or recommending a threshold level on a widely used language proficiency test that would indicate when ELL students' performance on a standardized content test would be valid from a linguistic standpoint… The use of an academic language proficiency assessment would allow for another option in assessing English language learners: Include ELL students in the testing process but assess only their growth in

> English proficiency until they reach the language proficiency threshold. In other words, for accountability purposes, students who do not reach the threshold would take a measure of English growth at the same time other students take a content assessment (Bailey, Butler, & Abedi, 2005, p. 104–105).

It is due to these ideas of linguistic/language demands, lack of content knowledge and vocabulary, and basic English proficiency that this research is looking at English language performance related to content test scores. If low proficiency ELLs are performing similarly then altering how we assess this group and how we use their scores for accountability purposes would benefit not only the students by reducing test anxiety, but also the schools by separating some ELLs from their accountability demands. To serve the ELL population better, it is important to make sure that they are being tested for the right reasons and that what they learn from that test is beneficial. Forcing all ELLs who have been in the U.S. for more than a year to take content assessments, disregarding their level of English proficiency may not be the most suitable option. Bailey, Butler, and Abedi contend that "development of a language test that emphasizes the academic language needed for accurate assessment of content knowledge could be used as an indicator of ELL readiness to take content tests" (Bailey, Butler, & Abedi, 2005, p. 102). This study aims to prove that suggestions like this could be a viable alternative to the current practices. These alternatives would promote testing the understanding of content of the students, rather than testing their understanding of content through the lens of their English proficiency.

Chapter 3: Methods

As discussed in Chapters 1 and 2, ELLs are generally grouped as a population, rather than broken down to examine individual variation within that population (considering their English proficiency level and other demographic information). In the previous chapters, the needs of ELL population were discussed, as well as the implications of test use on this population. The foundation of the current research as a study of construct and differential validity, as well as aspects of test usefulness including; validity, interactiveness, and impact were discussed. Details of previous research regarding the ELL population were discussed, including the performance gap between ELLs and non-ELLs, ELL overall performance, linguistic demands, and accommodation use. The current research is guided by four research questions that were introduced in chapter one.

In this chapter, the methods used to analyze the data for the study will be discussed and how the analysis reflects on the original research questions posed. This chapter will begin with a restatement of the research questions and hypotheses, then a description of the participants (the ELL students who took the assessments), next the assessment tools will be briefly described, and then the data collection and the data analysis procedures will be discussed.

Research Questions and Hypotheses

This study examines how different ELLs perform on their content assessments based on their English proficiency, as determined by the state's English language proficiency assessment. What follows is a review of the research questions posed and the hypotheses for each question:

Research Question 1: What are the outcomes of Kansas' content area assessments for Mathematics, Reading, and Science for ELLs by language proficiency level?

Hypothesis 1: The performance of ELLs on the content assessments is influenced by their ELP category. This difference between proficiency categories is especially pronounced at the lower ELP categories (between Beginner and Advanced, Beginner and Fluent, Intermediate and Advanced, Intermediate and Fluent).

Research Question 2: What are the relative effects of proficiency level on assessment scores across grade levels?

Hypothesis 2: As the cognitive demands on the content assessment increase (i.e., as the level of grades increases) the number of low language proficiency level students unable to meet state standards becomes more pronounced. If the null hypothesis were used in this situation, it could be assumed that no difference is perceptible based solely on proficiency level.

Research Question 3: To what extent does the KELPA predict students' scores on content assessments in Math, Reading, and Science?

Hypothesis 3: The scores on the KELPA will not be a predictor of content area scores in Math and Science, but will be in Reading.

Research Question 4: What role do other demographic variables (such as free and reduced lunch, Native Language, Gender, Length of Time in the U.S., or Exceptionality Code) play in student achievement on content assessments for ELLs?

Hypothesis 4: Some variables will reflect a positive relationship with student achievement (Native Language and Length of Time in the U.S.), no relationship with student achievement (Gender), or a negative relationship with student achievement (free and reduced lunch and Exceptionality Code).

Description of the participants

This research studies ELLs and their performance on state content assessments in the state of Kansas. Due to this focus, the participants are the ELLs that took the state proficiency assessment and at least one content assessment. This section will be primarily based on a summarization of participants by Peyton (2009) and the numbers from the dataset used in the current study. The KELPA is administered every year to about 33,000 students in the state who have been identified as ELLs. For the 2009–2010 dataset, there were 26,663 students given the KELPA in grades three through eleven (the grades that are administered content assessments). The two largest language groups are speakers of Spanish and speakers of Vietnamese. Hispanic students made up 81.4% of the 26,663 total ELL population or about 21,711 students. Vietnamese accounted for 3.3% of the population or about 888 students. The other languages that were above 1% were Chinese (about 300 students), German (about 374 students), Laotian (about 285 students), and Arabic (with about 239 students); there were 15 languages identified at less than 1% and 5.1% listed as other, making up the remaining 2,841 students.

In 2010, the number of ELL students varied in each grade with fourth to fifth and sixth to eighth both having 18.5% of the total ELL population (about 6,112 students each grade band). Kindergarten and ninth to twelfth grade both had 13.5% of the population (about 4,460 students each). First grade had 12.9% (about 4,262 students). Second grade had 12% (about 3,964 students). Lastly, third grade had the smallest percentage with 10.8% (about 3,568 students).

The services that Kansas ELLs receive vary by school and district. According to Peyton (2009), 70.7% of ELLs receive access to a combination approach to ESOL/Bilingual program. While 15.4% receive state ESOL, 6.1% has a parent waive their ESOL education, 3.7% receives Title III, 2.5% is assessed late, and 1.6% is in monitored status, which means they have received

ESOL services in the past, but are now in the mainstream classroom. According to the dataset, in grades three through eleven, most (89%) ELL students are in regular education (approximately 23,738 students). About 2,098 or 7.9% are identified as having an Exceptionality Code, and about 78 or 0.3% is listed as gifted. Approximately 749 or 2.8% of the remaining students are identified as having one of the following: autism, developmental disability, emotional disturbance, hearing impairment, multiple disabilities, mental retardation, other health impairment, orthopedic impairment, speech/language issues, traumatic brain injury, or visual impairment.

Instruments used for analysis

For this analysis, there were four major instruments used. The first is the KELPA. All the content data was pulled based on the inclusion of a KELPA score. The next instruments used were the Math, Reading, and Science content assessments. To be included in this research a participant had to have both a KELPA score and at least one content area score.

The Kansas English Language Proficiency Assessment (KELPA). The KELPA is administered in grade level bands. There are multiple test forms but they are consistent across a grade level band. The bands are from kindergarten to first grade, second to third grade, fourth to fifth grade, sixth to eight grade, and ninth to twelfth grade. In the year 2009, according to Peyton (2009), Kindergarten to first grade was the largest band with approximately 8,722 students, second to third grade had the next largest number of students with approximately 7,532, fourth to fifth and sixth to eight each had approximately 6,112 students per band, and ninth to twelfth had about 4,460 students. As the students grade level went up, the total number of students per band decreased. For this dataset third grade was by itself (since second does not take content assessments) and had approximately 4,300 students making it the smallest band, the next

smallest was ninth through eleventh with approximately 6,409 students, then came fourth and fifth with approximately 7,728, and last was sixth through eight with the largest population of approximately 8,226 students.

The KELPA takes approximately 90 to 120 minutes to administer depending on the grade level band. All grade level bands have four subsections that are added together to create a composite score. These subsections are: listening, reading, writing, and speaking. On each subsection, a proficiency score is given. The proficiency scores are: Beginning, Intermediate, Advanced, and Fluent. The Beginning proficiency is characterized by a lack of ability to understand in English, with common misspellings and mispronunciations. The Intermediate proficiency is characterized by an ability to understand informal conversations and questions spoken at a normal speed on familiar topics, as well as reading with some fluency and allowance for re-reading as necessary. The Advanced proficiency is characterized by the ability to speak and write well in English, and to read for information and description with the ability to react to information just read. In the Fluent proficiency there is an expectation of academic understanding. Fluent students should be able to participate and understand in almost any situation and be able to perform grade appropriate writing and reading. The descriptions of the proficiency scores can be seen in table 1. This table is from the Kansas State Department of Education.

Table 1: Kansas English Language Proficiency Assessment (KELPA) Performance Category Definitions for Total Score

Beginning	Intermediate	Advanced	Fluent

Demonstrates zero to limited ability in understanding the English language. May often mispronounce or misspell words.	May be able to understand most informal questions and conversations on familiar topics spoken distinctively at normal speed. May be able to read with some fluency and speed, but will often need to reread for clarification.	May speak and write in English in most situations. May be able to read for information and description, to follow sequence of events, and to react to information just read.	Can participate in academic settings without language support services. Is able to understand and participate in almost any conversation within the range of experience with a high degree of fluency. Should be able to read with fluency and speed. Older students in the Fluent category should also be able to write short papers and express statement of position, point of view, and arguments and should understand the meaning of new words from context.

(KSDE, n.d.)

In grades K-8, all students take the KELPA. Content assessments start in the third grade with Math and Reading, which are tested every year until the eighth grade and in high school. Science is tested in grades four, seven, and in high school. All content assessments in the state of Kansas are administered on the computer. Something that affects all students' content assessments at the high school level is the opportunity to learn rules. In high school, students are tested differently than in grades three to eight. Math and Reading follow the same rules; Science has its own rules regarding opportunity to learn. The core idea for this policy in Reading and Math is that high school students are assessed two times. If they score "proficient" the first time, they have completed the necessary NCLB testing in that skill. If they do not score "proficient", they are given a second opportunity to test in a later semester. The assessments have to be done by the end of their eleventh grade year. The Science assessment has two parts, one on life Science and one on physical Science, which can be given in any order. Science assessments are

given each year, with scores recorded until the students testing window closes at the end of their eleventh grade year (Science OTL/w-o Rules, 2009 & Reading and Math OTL/w Rules, 2009).

Reliability and validity studies were conducted on the KELPA. Validity measures came from comparing other English proficiency assessments to the KELPA to determine the validity of the test. Overall, the test was found to be valid and reliable with the ELL population. Each of the subskills (reading, writing, listening, and speaking) are strongly connected with the overall composite score (Peyton, et al., 2009). Test scores were also compared with teacher ratings of skills and correlated well (Peyton, et al., 2009). The final measure of validity was to look at the KELPA score compared to the Reading score from the general state assessments. The correlations were found to be consistent across time and reasonably strong (Peyton, et al., 2009).

Mathematics Assessment. The Mathematics assessment is performed every year for grades three to eight and up to two times in high school as part of the opportunity to learn as described previously. The test is broken into three testing sessions, two of which allow a calculator and one that does not (for all levels, except eighth grade). These sessions are not timed, but they last approximately 45–60 minutes. The number of indicators tested varies by grade: 3=12; 4=14; 5=15; 6=14; 7=15; 8=15, and HS=15. The number of questions also varies by grade level: 3=70; 4=73; 5=73; 6=86; 7=84; 8=86; and HS=84. There are four to eight items tested per indicator.

Reading Assessment. The Reading assessment is performed every year for grades three to eight and up to two times in high school as part of the opportunity to learn, as described previously. The test has three untimed (recommended 45 minutes) test sessions. Eleven to sixteen indicators are assessed for each grade level and the number of questions varies from 58 (grade three) to 84 (grade seven). There are four to seven items per indicator.

Science Assessment. The Science assessment is performed in grades four, seven, and in high school as part of the opportunity to learn, as described previously. In grades four and seven, there are two untimed sessions of about 45–60 minutes each. Grade four has 22 indicators tested, and a total of 44 items. Grade seven has 30 indicators tested, and 60 items total. High school is untimed and has two parts as well. Each part has 15 indicators, and 30 items. For all the levels, there are two items tested per indicator.

For all three content areas discussed above, all the questions are multiple choice. Paper and pencil versions of the test are available as an accommodation. There are five performance levels: Exemplary, Exceeds Standard, Meets Standard, Approaches Standard, and Academic Warning. ELLs take the state assessment and have the same AYP targets as the general population. For Mathematics and Science, a Spanish language version is available for those that received their instruction in Spanish (Kansas Mathematics/Science/Reading Assessment Fact Sheets 2011–2012). The reliability and validity of the tests were found to be positive. For both Math and Reading, reliabilities were high and misclassifications were low, and the validity measures were positive (Irwin, et al., 2007). A technical report developed by CETE indicated the reliability and validity of the Science assessment across the entire test taking population as being appropriate and indicated that there were no substantial differences between the paper and pencil test and the computerized version. There was no indication of the inclusion of ELLs in their research (Irwin, et al., 2009).

Procedures for data collection

The data used in this study came from the CETE at the University of Kansas. CETE collects all the state assessment data for the state of Kansas. This specific data was requested from CETE in the spring of 2011, while the researcher was a Graduate Research Assistant (GRA) at CETE.

Permission to use human subjects was requested from HSCL and this project received approval in the spring of 2011. The data includes the test scores for all ELL students on their KELPA, Math, Science, and ELA/Reading assessments for the school year 2009–2010. The data also contains demographic information describing the population and any accommodations that were used on the assessments. The demographic information comes from the Kansas Individual Data on Students (KIDS) system, also from CETE.

The original request of KIDS information was for the following categories: Gender; Date of Birth; Current Grade Level; Hispanic Ethnicity; School Entry Date; District Entry Date; State Entry Date; Exit/Withdrawal Type; Comprehensive Race; Eligibility for National School Lunch Program; Primary Disability Code; Gifted Student Code; ESOL/Bilingual Program Entry Date; First Entry Date into a School in the United States; First Language; ESOL/Bilingual Program Participation Code; ESOL/Bilingual Program Ending Date; Title I Participation; Title I Supplemental Educational Services (SES); Miles Transported; Served with At-Risk Funds; Immigrant Status; Country of Birth; Refugee Status. The researcher also requested KELPA data regarding domain scores, total Scores, and proficiency categories. Content area information was requested for Math, Reading, and Science regarding Continuous level scores and performance categories.

The researcher was granted from CETE all requested data from the KIDS system regarding Gender, Date of Birth, Current Grade Level, Hispanic Ethnicity, School Entry Date, District Entry Date, State Entry Date, Exit/Withdrawal Type, Comprehensive Race, Eligibility for National School Lunch Program, Primary Exceptionality Code, Secondary Exceptionality Code, ESOL/Bilingual Program Entry Date, First Entry Date into a School in the United States, First Language, ESOL/Bilingual Program Participation Code, and ESOL/Bilingual Program

Ending Date. All KELPA data and content assessment data was provided. The KIDS information that was not provided was not necessary, as the study has been designed. The information would be available from the State of Kansas rather than CETE if desired. The following were not provided with the data requested: Title I Participation, Title I SES, Miles Transported, Served with At-Risk Funds, Immigrant Status, Country of Birth, and Refugee Status.

Data Analysis

This study was aimed at evaluating a possible relationship between ELP, as determined by the KELPA, and scores on the state's content assessments.

To answer the first research question, "What are the outcomes of Kansas content area assessments for Mathematics, Reading, and Science for ELLs by language proficiency level*?*," the test scores for ELLs were reported for each content area assessment provided in the state of Kansas in the 2009–2010 school year. Student data was categorized into one of four proficiency groups, based on their KELPA scores by grade levels. A one-way analysis of variance was conducted for each grade level and content area separately. The dependent variables were the Mathematics, Reading, or Science content assessment scores and the independent variable was the KELPA proficiency category assigned to the student on the English Language proficiency assessment (i.e., Beginning, Intermediate, Advanced, or Fluent).

To answer the second research question "What are the relative effects of proficiency level on assessment scores across grade levels?," basic descriptive statistics were displayed using proportions showing how students performed on each content assessment based on grade level, and whether there were differences in the proportions of students who did or did not meet/exceed standards across grade levels for each content area separately.

To answer the third research question, "To what extent does the KELPA predict students' scores on content assessments in Math, Reading, and Science?" A bivariate linear regression analysis was used to predict scores based on equated percent correct content assessment scores. Student level data was analyzed by grade level for each content area separately. The dependent variable for the set of analyses was the content assessment score and the independent variable was the students' English language total score as determined by the KELPA.

The final research question is, "What role do other demographic variables (such as Free and Reduced Lunch, Native Language, Gender, Length of Time in the U.S., or Exceptionality Code) play in student achievement on content assessments for ELLs?" To answer this question, a set of multiple linear regression analyses were used to predict scores based on equated percent correct content assessment scores. For this set of analyses, the dependent variable was the content assessment score and the independent variables were: student-proficiency group based on total KELPA score (Beginning, Intermediate, Advanced, and Fluent); and then each of the following demographic variables; Free and Reduced Lunch status; the Native Language of the test taker (Spanish and other); the Gender of the test taker; the Lenth of Time in the U.S.; and the final variable was the students' Exceptionality Code.

Data Entry and Missing Data. The data set represents the students who were administered the KELPA and content assessments in 2010 in the state of Kansas. Data of all students tested was provided if they completed a content assessment and a KELPA in the year. Not all content areas are assessed every year. This means that there were grade levels that did not have scores for every test. Results were reported if both KELPA scores and content scores are available. When data has not been provided completely, it was removed from the study and reported as a percentage of tested individuals that were not analyzed for this study.

Ethical Issues. This research has the potential to change policy in assessment of ELLs in the future. For this reason, the research is significant. It is important to note that the researcher was granted access to data with the identifying information removed. Since the data was already free of identifying information, the biggest potential source of bias had been accounted for. The researcher made every attempt to perform the analysis in a scientific and unbiased way.

Summary

The results of this research should provide a better understanding of the assessment of ELLs in the schools and a higher level of accuracy in the interpretation of the test results of the ELLs. This chapter discussed the research questions and hypotheses, provided a description of the participants (the ELL students who took the assessments), briefly described the assessment tools, and lastly discussed the data analysis procedures. In chapter four, the data analysis and results will be discussed, based on the research questions. The results will be given based on grade and content area for the first three questions, and then using demographic variables for the final question. In chapter five, the final discussion will take place. The discussion will address how the current study's findings relate to the literature. There will also be a discussion of the limitations of the current study, and suggest areas where future research should focus.

Chapter 4: Results

This study examined the relationship between the performance of ELLs and the KELPA, as required for Title I and Title III, and the content area assessments for Reading, Math, and Science administered by the CETE for the state of Kansas. It looked at the predictive ability of the KELPA, based on grade and language proficiency of test-takers to determine content area scores, as well as how different demographic variables influence test scores. In this chapter, findings from various quantitative analyses conducted using the Statistical Analysis Software (SAS) and the assistance of a graduate statistics student are presented as they relate to the research questions.

The original data provided by CETE included all individuals tested during the time 2009–2010 school year. The first step was to remove the grades that were not given both a content assessment and the KELPA; this includes kindergarten through second and twelfth grades. All analyses were done by grade, even though the KELPA was administered to grade bands. This was done because the tests were not equated.

The data included in the study represents ELLs in the entire state of Kansas who took one of the content assessments (Reading, Math, or Science) and the KELPA from the spring 2010 testing period, in grades three through eleven. Due to the nature of the data, only complete pairs were analyzed. To be a complete pair, there had to be a content area test score and a KELPA score for the individual. The data was analyzed looking at just those pairs, so for an individual who took the KELPA, Math, and Science, two pairs were analyzed. That individual would not be part of the Reading analysis. Most data reported here has been rounded to the nearest hundredth.

Ninth grade presented problems across all tests. Very small populations were reported for each grade and proficiency level. For ninth grade Math, there were 2,263 students tested, but

only 112 were analyzed. There were 2 Beginning, 12 Intermediate, 33 Advanced, and 65 Fluent. For ninth grade Reading, there were 2,263 students tested, but only 26 were analyzed. There were no Beginning, 2 Intermediate, 8 Advanced, and 16 Fluent. For ninth grade Science, there were 2,263 students tested, but only 577 were analyzed. There were 6 Beginning, 69 Intermediate, 152 Advanced, and 350 Fluent. No indication of why these numbers were so low and disproportionate was given by CETE with the data. All the analyses were conducted and shared in this study, but due to the low population numbers of ninth grade the results may be biased.

> **Research Question 1:** What are the outcomes of Kansas content area assessments for Mathematics, Reading, and Science for ELLs by language proficiency level? The initial hypothesis stated that the performance of ELLs on the content assessments would be influenced by the ELP category. The difference between proficiency categories was believed to be especially pronounced between the lower English Language Proficiency categories and the higher ones (between Beginner and Advanced, Beginner and Fluent, Intermediate and Advanced, and Intermediate and Fluent).

A one-way analysis of variance (ANOVA) was conducted separately for each grade level and content area. The dependent variable was Mathematics, Reading, or the Science content assessment score and the independent variable was the KELPA proficiency category assigned to the student (i.e., Beginning, Intermediate, Advanced, or Fluent). For the content areas of Reading and Math, this meant that there were nine grades analyzed (third grade through eleventh grade), and Science had three grades analyzed (fourth, seventh, and ninth). For the analysis, an assumption of normality was used, and then the variance was checked. The ANOVA was then adjusted to run given the parameters of unequal variance. Brown and Forsythe's Test for

Homogeneity of Score Variance, ANOVA of Absolute Deviations from group medians was used, because group medians are not affected by skewedness or outliers as much as group means are. The other test that uses medians is the Bartlett's Test for Homogeneity of Score Variance. These scores are reported for each grade, as well as the general ANOVA findings.

Content Area Math

Math students were tested every year from third grade until eleventh grade. They were also given the KELPA each of those years. In order to analyze the data, each grade was evaluated individually since the tests were not equated.

Third grade Math. The first grade to administer both the Math content area test and the KELPA is the third grade. There were 4,300 KELPA tests administered, and of those 4,191 had a Math score counterpart. In checking the normality of residuals, the Mean Square Error (MSE) of the group was 153.91, with an R-Square of 0.30. The normality assumption was met, but there was a lot of variance and the MSE was inflated due to that variance. A one-way ANOVA was conducted to compare the effect of the Math content assessment score on the KELPA proficiency group. An analysis of variance showed that the effect of the Math content assessment score on the KELPA proficiency category was significant, F (3, 4187) = 619.45, p = .0001. The ANOVA had a MSE of 153.08, and an R-Square of 0.31. There was a coefficient variance of 15.49 and Root MSE of 12.37. The mean for Math was 79.89. Using Brown and Forsythe's Test for Homogeneity of Math Score Variance ANOVA of Absolute Deviations from group Medians, the MSE was 63.05. Bartlett's Test for Homogeneity of Math Score Variance had a Chi-Square of 530.7.

Table 2: Third Grade Math

Proficiency Level	Number of Participants	Mean	Standard Deviation
Beginning	236	59.09	18.72
Intermediate	1,108	71.84	15.13

Advanced	1,538	81.15	11.79
Fluent	1,309	88.98	8.37

The basic information for third grade Math can be found in Table 2 above. These means represent the Least Square Means (LSM) for the different proficiency groups. The differences in LSM between Beginning and Intermediate is -12.75 with a standard error of 1.30 and a t value of -9.80. For the Beginning to Advanced group, the estimate is -22.06 with a standard error of 1.23 and a t-value of -17.57. From the Beginning to the Fluent group, the estimate is -29.89 with a standard error of 1.24 and a t-value of -24.10. From the Intermediate to Advanced group, the estimate is -9.31 with a standard error of 0.55 and a t-value of -17.08. From the Intermediate to the Fluent group, the estimate is -17.14 with a standard error of 0.51 and a t-value of -33.61. The final group considered was the Advanced to the Fluent group, with an estimate of -7.83 and a standard error of 0.38 and a t-value of -20.65.

Fourth grade Math. There were 4,109 KELPA tests administered, and of those 3,991 had a Math score counterpart. In checking the normality of residuals, the MSE of the group was 161.74, with an R-Square of 0.32. A one-way ANOVA was conducted to compare the effect of the Math content assessment score on the KELPA proficiency group. An analysis of variance showed that the effect of the Math content assessment score on the KELPA proficiency category was significant, $F(3, 3987) = 627.07$, $p = .0001$. The ANOVA had a MSE of 161.42, and an R-Square of 0.32. There was a coefficient variance of 17.44 and Root MSE of 12.71. The mean for Math was 72.85. Using Brown and Forsythe's Test for Homogeneity of Math Score Variance ANOVA of Absolute Deviations from group medians, the MSE was 57.25. Bartlett's Test for Homogeneity of Math Score Variance had a Chi-Square of 295.8.

Table 3: Fourth Grade Math

Proficiency Level	Number of Participants	Mean	Standard Deviation
Beginning	279	53.84	18.67
Intermediate	1,124	64.56	14.47
Advanced	1,423	74.81	11.86
Fluent	1,165	83.01	9.74

The basic information for fourth grade Math can be found in Table 3 above. These means represent the LSMs for the different proficiency groups. The difference in LSM between Beginning and Intermediate is -10.72, with a standard error of 1.20 and a t-value of -8.95. For the Beginning to Advanced group, the estimate is -20.97, with a standard error of 1.16 and a t-value of -18.06. From the Beginning to the Fluent group, the estimate is -29.17, with a standard error of 1.15 and a t-value of -25.28. From the Intermediate to Advanced group, the estimate is -10.25, with a standard error of 0.53 and a t-value of -19.20. From the Intermediate to the Fluent group, the estimate is -18.45, with a standard error of 0.52 and a t-value of -35.59. The final group considered was the Advanced to the Fluent group, with an estimate of -8.20 and a standard error of 0.43 and a t-value of -19.25.

Fifth grade Math. There were 3,619 KELPA tests administered, and of those 3,518 had a Math score counterpart. In checking the normality of residuals, the MSE of the group was 158.41, with an R-Square of 0.29. A one-way ANOVA was conducted to compare the effect of the Math content assessment score on the KELPA proficiency group. An analysis of variance showed that the effect of the Math content assessment score on the KELPA proficiency category was significant, $F(3, 3514) = 489.80$, $p = .0001$. The ANOVA had a MSE of 158.07, and an R-Square of 0.30. There was a coefficient variance of 17.62 and Root MSE of 12.57. The mean for Math was 71.36. Using Brown and Forsythe's Test for Homogeneity of Math Score Variance

ANOVA of Absolute Deviations from group Medians, the MSE was 55.43. Bartlett's Test for Homogeneity of Math Score Variance had a Chi-Square of 55.41.

Table 4: Fifth Grade Math

Proficiency Level	Number of Participants	Mean	Standard Deviation
Beginning	155	50.36	16.66
Intermediate	635	61.61	13.47
Advanced	1,218	69.15	12.67
Fluent	1,510	79.40	11.58

The basic information for fifth grade Math can be found in Table 4 above. These means represent the LSMs for the different proficiency groups. The difference in LSM between Beginning and Intermediate is -11.25, with a standard error of 1.44 and a t-value of -7.80. For the Beginning to Advanced group, the estimate is -18.79, with a standard error of 1.39 and a t-value of -13.55. From the Beginning to the Fluent group, the estimate is -29.04 with a standard error of 1.38 and a t-value of -21.18. From the Intermediate to Advanced group, the estimate is -7.54 with a standard error of 0.65 and a t-value of -11.67. From the Intermediate to the Fluent group, the estimate is -17.79 with a standard error of 0.61 and a t-value of -29.08. The final group considered was the Advanced to the Fluent group, with an estimate of -10.25 and a standard error of 0.47 and a t-value of -21.82.

Sixth grade Math. There were 3,174 KELPA tests administered, and of those 3,104 had a Math score counterpart. In checking the normality of residuals, the MSE of the group was 192.28, with an R-Square of 0.33. A one-way ANOVA was conducted to compare effect of the Math content assessment score on the KELPA proficiency group. An analysis of variance showed that the effect of the Math content assessment score on the KELPA proficiency category was significant, $F(3, 3100) = 500.45$, $p = .0001$. The ANOVA had a MSE of 192.29, and an R-Square of 0.33. There was a coefficient variance of 19.93 and Root MSE of 13.87. The mean for

Math was 69.57. Using Brown and Forsythe's Test for Homogeneity of Math Score Variance, the ANOVA of Absolute Deviations from group Medians, and the MSE was 65.72. Bartlett's Test for Homogeneity of Math Score Variance had a Chi-Square of 93.10.

Table 5: Sixth Grade Math

Proficiency Level	Number of Participants	Mean	Standard Deviation
Beginning	129	46.82	16.93
Intermediate	960	59.85	15.37
Advanced	1,326	71.84	13.69
Fluent	689	83.01	11.09

The basic information for sixth grade Math can be found in Table 5 above. These means represent LSMs for the different proficiency groups. The difference in LSM between Beginning and Intermediate is -13.03 with a standard error of 1.57 and a t-value of -8.30. For the Beginning to Advanced group, the estimate is -25.01 with a standard error of 1.54 and a t-value of -16.27. From the Beginning to the Fluent group, the estimate is -36.19 with a standard error of 1.55 and a t-value of -23.36. From the Intermediate to Advanced group, the estimate is -11.98 with a standard error of 0.62 and a t-value of -19.25. From the Intermediate to the Fluent group, the estimate is -23.16 with a standard error of 0.65 and a t-value of -35.54. The final group considered was the Advanced to the Fluent group, with an estimate of -11.18 and a standard error of 0.57 and a t-value of -19.76.

Seventh grade Math. There were 2,662 KELPA tests administered, and of those, 2,577 had a Math score counterpart. In checking the normality of residuals, the MSE of the group was 209.59, with an R-Square of 0.28. A one-way ANOVA was conducted to compare the effect of the Math content assessment score on the KELPA proficiency group. An analysis of variance showed that the effect of the Math content assessment score on the KELPA proficiency category was significant, $F(3, 2573) = 339.00$, $p = .0001$. The ANOVA had a MSE of 208.10, and an R-

Square of 0.28. There was a coefficient variance of 24.41 and Root MSE of 14.43. The mean for Math was 59.10. Using Brown and Forsythe's Test for Homogeneity of Math Score Variance ANOVA of Absolute Deviations from group Medians the MSE was 71.59. Bartlett's Test for Homogeneity of Math Score Variance had a Chi-Square of 18.89.

Table 6: Seventh Grade Math

Proficiency Level	Number of Participants	Mean	Standard Deviation
Beginning	105	41.44	15.54
Intermediate	690	49.78	14.96
Advanced	1,105	58.70	14.82
Fluent	677	72.20	12.97

The basic information for seventh grade Math can be found in Table 6 above. These means represent the LSMs for the different proficiency groups. The difference in LSM between Beginning and Intermediate is -8.14 with a standard error of 1.62 and a t-value of -5.03. For the Beginning to Advanced group, the estimate is -17.27 with a standard error of 1.58 and a t-value of -10.92. From the Beginning to the Fluent group, the estimate is -30.76 with a standard error of 1.60 and a t-value of -19.27. From the Intermediate to Advanced group, the estimate is -9.12 with a standard error of 0.72 and a t-value of -12.62. From the Intermediate to the Fluent group, the estimate is -22.62 with a standard error of 0.76 and a t-value of -29.89. The final group considered was the Advanced to the Fluent group, with an estimate of -13.50 and a standard error of 0.67 and a t-value of -20.18.

Eighth grade Math. There were 2,290 KELPA tests administered, and of those 2,315 had a Math score counterpart. In checking the normality of residuals, the MSE of the group was 244.97, with an R-Square of 0.24. A one-way ANOVA was conducted to compare the effect of the Math content assessment score on the KELPA proficiency group. An analysis of variance showed that the effect of the Math content assessment score on the KELPA proficiency category

was significant, F (3, 2311) = 247.58, p = .0001. The ANOVA had a MSE of 243.83, and an R-Square of 0.24. There was a coefficient variance of 26.80 and Root MSE of 15.62. The mean for Math was 58.27. Using Brown and Forsythe's Test for Homogeneity of Math Score Variance ANOVA of Absolute Deviations from group Medians, the MSE was 81.44. Bartlett's Test for Homogeneity of Math Score Variance had a Chi-Square of 6.48.

Table 7: Eighth Grade Math

Proficiency Level	Number of Participants	Mean	Standard Deviation
Beginning	107	39.90	13.97
Intermediate	418	47.03	16.44
Advanced	891	55.82	15.83
Fluent	899	68.10	15.18

The basic information for eighth grade Math can be found in Table 7 above. These means represent the LSMs for the different proficiency groups. The difference in LSM between Beginning and Intermediate is -7.14, with a standard error of 1.57 and a t-value of -4.54. For the Beginning to Advanced group, the estimate is -15.93 with a standard error of 1.45 and a t-value of -10.98. From the Beginning to the Fluent group, the estimate is -28.20 with a standard error of 1.44 and a t-value of -19.56. From the Intermediate to Advanced group, the estimate is -8.79 with a standard error of 0.96 and a t-value of -9.12. From the Intermediate to the Fluent group, the estimate is -21.07 with a standard error of 0.95 and a t-value of -22.17. The final group considered was the Advanced to the Fluent group, with an estimate of -12.28 and a standard error of 0.73 and a t-value of -16.74.

Ninth grade Math. There were 2,263 KELPA tests administered, and of those 112 had a Math score counterpart. In checking the normality of residuals, the MSE of the group was 291.67, with an R-Square of 0.24. A One-way ANOVA was conducted to compare the effect of the Math content assessment score on the KELPA proficiency group. An analysis of variance

showed that the effect of the Math content assessment score on the KELPA proficiency category was significant, F (3, 108) = 12.55, p = .0001. The ANOVA had a MSE of 290.74, and an R-Square of 0.26. There was a coefficient variance of 30.56 and Root MSE of 17.05. The mean for Math was 55.80. Using Brown and Forsythe's Test for Homogeneity of Math Score Variance ANOVA of Absolute Deviations from group Medians the MSE was 99.49. Bartlett's Test for Homogeneity of Math Score Variance had a Chi-Square of 14.21.

Table 8: Ninth Grade Math

Proficiency Level	Number of Participants	Mean	Standard Deviation
Beginning	2	40.00	14.14
Intermediate	12	36.92	6.43
Advanced	33	47.94	14.44
Fluent	65	63.77	19.40

The basic information for ninth grade Math can be found in Table 8 above. These means represent the LSMs for the different proficiency groups. The difference in LSM between Beginning and Intermediate is 3.08 with a standard error of 10.17 and a t-value of 0.30. For the Beginning to Advanced group, the estimate is -7.94 with a standard error of 10.31 and a t-value of -0.77. From the Beginning to the Fluent group, the estimate is -23.77, with a standard error of 10.29 and a t-value of -2.31. From the Intermediate to Advanced group, the estimate is -11.02 with a standard error of 3.12 and a t-value of -3.53. From the Intermediate to the Fluent group, the estimate is -26.85 with a standard error of 3.04 and a t-value of -8.84. The final group considered was the Advanced to the Fluent group, with an estimate of -15.83 and a standard error of 3.48 and a t-value of -4.55.

Tenth grade Math. There were 1,638 KELPA tests administered, and of those 990 had a Math score counterpart. In checking the normality of residuals, the MSE of the group was 238.22, with an R-Square of 0.23. A one-way ANOVA was conducted to compare the effect of

the Math content assessment score on the KELPA proficiency group. An analysis of variance showed that the effect of the Math content assessment score on the KELPA proficiency category was significant, F (3, 986) = 99.10, p = .0001. The ANOVA had an MSE of 236.78, and an R-Square of 0.23. There was a coefficient variance of 32.77 and Root MSE of 15.39. The mean for Math was 46.96. Using Brown and Forsythe's Test for Homogeneity of Math Score Variance ANOVA of Absolute Deviations from group Medians the MSE was 86.86. Bartlett's Test for Homogeneity of Math Score Variance had a Chi-Square of 42.14.

Table 9: Tenth Grade Math

Proficiency Level	Number of Participants	Mean	Standard Deviation
Beginning	27	27.22	9.44
Intermediate	168	35.05	11.33
Advanced	261	41.65	15.36
Fluent	534	54.29	16.69

The basic information for tenth grade Math can be found in Table 9 above. These means represent the LSMs for the different proficiency groups. The difference in LSM between Beginning and Intermediate is -7.83 with a standard error of 2.02 and a t-value of -3.89. For the Beginning to Advanced group, the estimate is -14.43 with a standard error of 2.05 and a t-value of -7.04. From the Beginning to the Fluent group, the estimate is -27.07 with a standard error of 1.95 and a t-value of -13.85. From the Intermediate to Advanced group, the estimate is -6.59 with a standard error of 1.29 and a t-value of -5.11. From the Intermediate to the Fluent group, the estimate is -19.24 with a standard error of 1.13 and a t-value of -16.97. The final group considered was the Advanced to the Fluent group, with an estimate of -12.64 and a standard error of 1.19 and a t-value of -10.59.

Eleventh grade Math. There were 2,508 KELPA tests administered, and of those 2,068 had a Math score counterpart. In checking the normality of residuals, the MSE of the group was

215.64, with an R-Square of 0.10. A one-way ANOVA was conducted to compare the effect of the Math content assessment score on the KELPA proficiency group. An analysis of variance showed that the effect of the Math content assessment score on the KELPA proficiency category was significant, F (3, 2064) = 78.63, p = .0001. The ANOVA had an MSE of 214.89, and an R-Square of 0.10. There was a coefficient variance of 34.64 and Root MSE of 14.66. The mean for Math was 42.32. Using Brown and Forsythe's Test for Homogeneity of Math Score Variance ANOVA of Absolute Deviations from group Medians the MSE was 84.54. Bartlett's Test for Homogeneity of Math Score Variance had a Chi-Square of 63.67.

Table 10: Eleventh Grade Math

Proficiency Level	Number of Participants	Mean	Standard Deviation
Beginning	90	27.86	9.47
Intermediate	577	37.39	13.29
Advanced	601	43.00	13.91
Fluent	800	47.00	16.51

The basic information for eleventh grade Math can be found in Table 10 above. These means represent LSMs for the different proficiency groups. The difference in LSM between Beginning and Intermediate is -9.53, with a standard error of 1.14 and a t-value of -8.35. For the Beginning to Advanced group, the estimate is -15.14 with a standard error of 1.15 and a t-value of -13.19. From the Beginning to the Fluent group, the estimate is -19.15 with a standard error of 1.16 and a t-value of -16.56. From the Intermediate to Advanced group, the estimate is -5.61 with a standard error of 0.79 and a t-value of -7.08. From the Intermediate to the Fluent group, the estimate is -9.62 with a standard error of 0.80 and a t-value of -11.96. The final group considered was the Advanced to the Fluent group, with an estimate of -4.00 and a standard error of 0.81 and a t-value of -4.92.

Summary of Math Content Area. Language proficiency category was found to be significant at all grade levels in Math ($Pr > F < .0001$). In all except the ninth grade, the language proficiency levels were an indicator of overall performance, with the beginning students doing the worst up to the Fluent students doing the best. In all but two grades (eighth and ninth), the standard deviations were highest for the Beginning students and got progressively lower until the Fluent level. The largest Estimate value was the category of Beginning to Fluent in all but ninth grade. The next largest Estimate values were Beginning to Advanced (four times) and then Intermediate to Fluent (three times). The lowest Estimates were in Advanced to Fluent (four times) and Beginning to Intermediate (three times). This data supports the original hypothesis that larger differences would be present in the high-to-low combinations (Beginning to Advance, Beginning to Fluent, and Intermediate to Fluent) and the smaller differences would be the categories next to each other (Beginning to Intermediate, Intermediate to Advanced, and Advanced to Fluent).

Content Area Reading

For Reading, students were given tests every year from third grade until eleventh grade. They were also given the KELPA each of those years. In order to analyze the data, each grade will be evaluated individually since the tests were not equated.

Third grade Reading. The first grade that is administered both the Reading content area test and the KELPA is third grade. There were 4,300 KELPA tests administered, and of those 4,103 had a Reading score counterpart. In checking the normality of residuals, the MSE of the group was 132.62, with an R-Square of 0.39. A one-way ANOVA was conducted to compare the effect of the Reading content assessment score on the KELPA proficiency group. An analysis of variance showed that the effect of the Reading content assessment score on the KELPA

proficiency category was significant, F (3, 4099) = 881.55, p = .0001. The ANOVA had a MSE of 132.10, and an R-Square of 0.39. There was a coefficient variance of 16.14 and Root MSE of 11.49. The mean for Reading was 71.19. Using Brown and Forsythe's Test for Homogeneity of Reading Score Variance ANOVA of Absolute Deviations from group Medians, the MSE was 49.09. Bartlett's Test for Homogeneity of Reading Score Variance had a Chi-Square of 369.0.

Table 11: Third Grade Reading

Proficiency Level	Number of Participants	Mean	Standard Deviation
Beginning	188	53.50	18.31
Intermediate	1,085	60.61	13.89
Advanced	1,525	71.16	10.42
Fluent	1,305	82.57	8.94

The basic information for third grade Reading can be found in Table 11 above. These means represent the LSMs for the different proficiency groups. The difference in LSM between Beginning and Intermediate is -7.12, with a standard error of 1.40 and a t-value of -5.08. For the Beginning to Advanced group, the estimate is -17.67 with a standard error of 1.36 and a t-value of -12.97. From the Beginning to the Fluent group, the estimate is -29.08, with a standard error of 1.36 and a t-value of -21.41. From the Intermediate to Advanced group, the estimate is -10.55 with a standard error of 0.50 and a t-value of -21.14. From the Intermediate to the Fluent group, the estimate is -21.96 with a standard error of 0.49 and a t-value of -44.91. The final group considered was the Advanced to the Fluent group, with an estimate of -11.41 and a standard error of 0.36 and a t-value of -31.36.

Fourth grade Reading. There were 4,109 KELPA tests administered, and of those 3,915 had a Reading score counterpart. In checking the normality of residuals, the MSE of the group was 116.95, with an R-Square of 0.43. A one-way ANOVA was conducted to compare the effect of the Reading content assessment score on the KELPA proficiency group. An analysis of

variance showed that the effect of the Reading content assessment score on the KELPA proficiency category was significant, F (3, 3911) = 1007.80, p = .0001. The ANOVA had a MSE of 115.93, and an R-Square of 0.44. There was a coefficient variance of 14.71 and Root MSE of 10.77. The mean for Reading was 73.21. Using Brown and Forsythe's Test for Homogeneity of Reading Score Variance ANOVA of Absolute Deviations from group Medians the MSE was 42.95. Bartlett's Test for Homogeneity of Reading Score Variance had a Chi-Square of 599.2.

Table 12: Fourth Grade Reading

Proficiency Level	Number of Participants	Mean	Standard Deviation
Beginning	234	50.73	18.57
Intermediate	1,100	63.97	12.93
Advanced	1,420	75.37	9.45
Fluent	1,161	83.86	7.35

The basic information for fourth grade Reading can be found in Table 12 above. These means represent the LSMs for the different proficiency groups. The difference in LSM between Beginning and Intermediate is -13.24, with a standard error of 1.27 and a t-value of -10.39. For the Beginning to Advanced group, the estimate is -24.64 with a standard error of 1.24 and a t-value of -19.88. From the Beginning to the Fluent group, the estimate is -33.13 with a standard error of 1.23 and a t-value of -26.88. From the Intermediate to Advanced group, the estimate is -11.40 with a standard error of 0.46 and a t-value of -24.59. From the Intermediate to the Fluent group, the estimate is -19.89 with a standard error of 0.45 and a t-value of -44.65. The final group considered was the Advanced to the Fluent group, with an estimate of -8.49 and a standard error of 0.33 and a t-value of -25.67.

Fifth grade Reading. There were 3,619 KELPA tests administered, and of those 3,438 had a Reading score counterpart. In checking the normality of residuals, the MSE of the group was 130.07, with an R-Square of 0.43. A One-way ANOVA was conducted to compare the

effect of the Reading content assessment score on the KELPA proficiency group. An analysis of variance showed that the effect of the Reading content assessment score on the KELPA proficiency category was significant, F (3, 3424) = 861.01, p = .0001. The ANOVA had a MSE of 128.88, and an R-Square of 0.43. There was a coefficient variance of 16.15 and Root MSE of 11.40. The mean for Reading was 70.56. Using Brown and Forsythe's Test for Homogeneity of Reading Score Variance ANOVA of Absolute Deviations from group Medians the MSE was 48.55. Bartlett's Test for Homogeneity of Reading Score Variance had a Chi-Square of 164.6.

Table 13: Fifth Grade Reading

Proficiency Level	Number of Participants	Mean	Standard Deviation
Beginning	110	42.86	15.53
Intermediate	612	57.32	13.90
Advanced	1,212	67.98	11.65
Fluent	1,504	80.06	9.56

The basic information for fifth grade Reading can be found in Table 13 above. These means represent the LSMs for the different proficiency groups. The difference in LSM between Beginning and Intermediate is -14.47 with a standard error of 1.58 and a t-value of -9.14. For the Beginning to Advanced group, the estimate is -25.12 with a standard error of 1.52 and a t-value of -16.55. From the Beginning to the Fluent group, the estimate is -37.21 with a standard error of 1.50 and a t-value of -24.79. From the Intermediate to Advanced group, the estimate is -10.66 with a standard error of 0.65 and a t-value of -16.30. From the Intermediate to the Fluent group, the estimate is -22.74 with a standard error of 0.61 and a t-value of -37.06. The final group considered was the Advanced to the Fluent group, with an estimate of -12.08 and a standard error of 0.42 and a t-value of -29.07.

Sixth grade Reading. There were 3,174 KELPA tests administered, and of those 3,032 had a Reading score counterpart. In checking the normality of residuals, the MSE of the group

was 144.71, with an R-Square of 0.44. A one-way ANOVA was conducted to compare the effect of the Reading content assessment score on the KELPA proficiency group. An analysis of variance showed that the effect of the Reading content assessment score on the KELPA proficiency category was significant, F (3, 3028) = 808.65, p = .0001. The ANOVA had a MSE of 143.65, and an R-Square of 0.45. There was a coefficient variance of 17.46 and Root MSE of 11.99. The mean for Reading was 68.64. Using Brown and Forsythe's Test for Homogeneity of Reading Score Variance ANOVA of Absolute Deviations from group Medians the MSE was 51.99. Bartlett's Test for Homogeneity of Reading Score Variance had a Chi-Square of 324.0.

Table 14: Sixth Grade Reading

Proficiency Level	Number of Participants	Mean	Standard Deviation
Beginning	92	41.62	15.53
Intermediate	936	56.69	14.85
Advanced	1,318	71.71	11.21
Fluent	686	82.68	7.75

The basic information for sixth grade Reading can be found in Table 14 above. These means represent the LSMs for the different proficiency groups. The difference in LSM between Beginning and Intermediate is -16.07 with a standard error of 1.69 and a t-value of -8.19. For the Beginning to Advanced group, the estimate is -30.09 with a standard error of 1.65 and a t-value of -19.26. From the Beginning to the Fluent group, the estimate is -41.06 with a standard error of 1.65 and a t-value of -24.95. From the Intermediate to Advanced group, the estimate is -15.02 with a standard error of 0.58 and a t-value of -26.10. From the Intermediate to the Fluent group, the estimate is -25.99 with a standard error of 0.57 and a t-value of -45.72. The final group considered to the Fluent group was the Advanced, with an estimate of -10.97 and a standard error of 0.43 and a t-value of -25.66.

Seventh grade Reading. There were 2,662 KELPA tests administered, and of those 2,515 had a Reading score counterpart. In checking the normality of residuals, the MSE of the group was 123.62, with an R-Square of 0.49. A One-way ANOVA was conducted to compare the effect of the Reading content assessment score on the KELPA proficiency group. An analysis of variance showed that the effect of the Reading content assessment score on the KELPA proficiency category was significant, F (3, 2511) = 804.61, p = .0001. The ANOVA had a MSE of 123.15, and an R-Square of 0.49. There was a coefficient variance of 16.33 and Root MSE of 11.10. The mean for Reading was 67.95. Using Brown and Forsythe's Test for Homogeneity of Reading Score Variance ANOVA of Absolute Deviations from group Medians the MSE was 44.89. Bartlett's Test for Homogeneity of Reading Score Variance had a Chi-Square of 131.7.

Table 15: Seventh Grade Reading

Proficiency Level	Number of Participants	Mean	Standard Deviation
Beginning	64	40.23	13.39
Intermediate	676	54.54	12.92
Advanced	1,097	69.48	11.23
Fluent	678	81.47	8.34

The basic information for seventh grade Reading can be found in Table 15 above. These means represent the LSMs for the different proficiency groups. The difference in LSM between Beginning and Intermediate is -14.30 with a standard error of 1.75 and a t-value of -8.19. For the Beginning to Advanced group, the estimate is -29.24 with a standard error of 1.71 and a t-value of -17.13. From the Beginning to the Fluent group, the estimate is -41.24 with a standard error of 1.70 and a t-value of -24.20. From the Intermediate to Advanced group, the estimate is -14.94 with a standard error of 0.60 and a t-value of -24.84. From the Intermediate to the Fluent group, the estimate is -26.93 with a standard error of 0.59 and a t-value of -45.56. The final group

considered to the Fluent group was the Advanced, with an estimate of -11.99 and a standard error of 0.47 and a t-value of -25.71.

Eighth grade Reading. There were 2,390 KELPA tests administered, and of those 2,242 had a Reading score counterpart. In checking the normality of residuals, the MSE of the group was 161.56, with an R-Square of 0.44. A one-way ANOVA was conducted to compare the effect of the Reading content assessment score on the KELPA proficiency group. An analysis of variance showed that the effect of the Reading content assessment score on the KELPA proficiency category was significant, F (3, 2238) = 573.85, p = .0001. The ANOVA had an MSE of 161.66, and an R-Square of 0.44. There was a coefficient variance of 19.40 and Root MSE of 12.72. The mean for Reading was 65.53. Using Brown and Forsythe's Test for Homogeneity of Reading Score Variance ANOVA of Absolute Deviations from group Medians, the MSE was 61.11. Bartlett's Test for Homogeneity of Reading Score Variance had a Chi-Square of 78.53.

Table 16: Eighth Grade Reading

Proficiency Level	Number of Participants	Mean	Standard Deviation
Beginning	70	36.81	14.65
Intermediate	396	49.88	15.65
Advanced	880	63.13	12.75
Fluent	896	77.03	10.95

The basic information for eighth grade Reading can be found in Table 16 above. These means represent the LSMs for the different proficiency groups. The difference in LSM between Beginning and Intermediate is -13.07 with a standard error of 1.92 and a t-value of -6.81. For the Beginning to Advanced group, the estimate is -26.31 with a standard error of 1.80 and a t-value of -14.59. From the Beginning to the Fluent group, the estimate is -40.22 with a standard error of 1.79 and a t-value of -22.48. From the Intermediate to Advanced group, the estimate is -13.25 with a standard error of 0.90 and a t-value of -14.78. From the Intermediate to the Fluent group,

the estimate is -27.15 with a standard error of 0.87 and a t-value of -31.31. The final group considered was the Advanced to the Fluent group, with an estimate of -13.91 and a standard error of 0.57 and a t-value of -24.63.

Ninth grade Reading. There were 2,263 KELPA tests administered, and of those 26 had a Reading score counterpart. In checking the normality of residuals, the MSE of the group was 271.86, with an R-Square of 0.37. A one-way ANOVA was conducted to compare the effect of the Reading content assessment score on the KELPA proficiency group. An analysis of variance showed that the effect of the Reading content assessment score on the KELPA proficiency category was significant, $F(2, 23) = 7.09$, $p = .0040$. The ANOVA had a MSE of 278.62, and an R-Square of 0.38. There was a coefficient variance of 26.84 and Root MSE of 16.69. The mean for Reading was 62.19. Using Brown and Forsythe's Test for Homogeneity of Reading Score Variance ANOVA of Absolute Deviations from group Medians the MSE was 141.3. Bartlett's Test for Homogeneity of Reading Score Variance had a Chi-Square of 1.43.

Table 17: Ninth Grade Reading

Proficiency Level	Number of Participants	Mean	Standard Deviation
Beginning	0	0	0
Intermediate	82	27.50	4.95
Advanced	8	54.50	15.49
Fluent	16	70.38	17.71

The basic information for ninth grade Reading can be found in Table 17 above. These means represent the LSMs for the different proficiency groups. The differences in LSM between Beginning and all other levels do not exist, as there were no individuals at the Beginning level in this grade. From the Intermediate to Advanced group the estimate is -27.00 with a standard error of 6.50 and a t-value of -4.15. From the Intermediate to the Fluent group, the estimate is -42.88 with a standard error of 5.64 and a t-value of -7.60. The final group considered was the

Advanced to the Fluent group with an estimate of -15.88 and a standard error of 7.04 and a t-value of -2.25.

Tenth grade Reading. There were 1,638 KELPA tests administered, and of those 990 had a Reading score counterpart. In checking the normality of residuals, the MSE of the group was 192.71, with an R-Square of 0.36. A one-way ANOVA was conducted to compare the effect of the Reading content assessment score on the KELPA proficiency group. An analysis of variance showed that the effect of the Reading content assessment score on the KELPA proficiency category was significant, F (3, 970) = 181.16, p = .0001. The ANOVA had a MSE of 191.75, and an R-Square of 0.36. There was a coefficient variance of 22.43 and Root MSE of 13.85. The mean for Reading was 61.75. Using Brown and Forsythe's Test for Homogeneity of Reading Score Variance ANOVA of Absolute Deviations from group Medians the MSE was 72.50. Bartlett's Test for Homogeneity of Reading Score Variance had a Chi-Square of 25.99.

Table 18: Tenth Grade Reading

Proficiency Level	Number of Participants	Mean	Standard Deviation
Beginning	10	28.60	5.08
Intermediate	135	44.40	16.94
Advanced	265	54.35	13.90
Fluent	564	69.97	13.08

The basic information for tenth grade Reading can be found in Table 18 above. These means represent the LSMs for the different proficiency groups. The difference in LSM between Beginning and Intermediate is -15.80 with a standard error of 2.17 and a t-value of -7.28. For the Beginning to Advanced group, the estimate is -25.75 with a standard error of 1.82 and a t-value of -14.15. From the Beginning to the Fluent group, the estimate is -41.37 with a standard error of 1.70 and a t-value of -24.35. From the Intermediate to Advanced group, the estimate is -9.95 with a standard error of 1.70 and a t-value of -5.89. From the Intermediate to the Fluent group,

the estimate is -25.57 with a standard error of 1.56 and a t-value of -16.40. The final group considered was the Advanced to the Fluent group, with an estimate of -15.62 and a standard error of 1.02 and a t-value of -15.37.

Eleventh grade Reading. There were 2,508 KELPA tests administered, and of those 2,121 had a Reading score counterpart. In checking the normality of residuals, the MSE of the group was 173.58, with an R-Square of 0.36. A one-way ANOVA was conducted to compare the effect of the Reading content assessment score on the KELPA proficiency group. An analysis of variance showed that the effect of the Reading content assessment score on the KELPA proficiency category was significant, F (3, 2117) = 404.67, p = .0001. The ANOVA had a MSE of 172.89, and an R-Square of 0.37. There was a coefficient variance of 23.98 and Root MSE of 13.15. The mean for Reading was 54.83. Using Brown and Forsythe's Test for Homogeneity of Reading Score Variance ANOVA of Absolute Deviations from group Medians the MSE was 66.90. Bartlett's Test for Homogeneity of Reading Score Variance had a Chi-Square of 26.66.

Table 19: Eleventh Grade Reading

Proficiency Level	Number of Participants	Mean	Standard Deviation
Beginning	68	31.59	7.91
Intermediate	550	41.86	13.03
Advanced	602	55.15	13.19
Fluent	901	64.29	13.50

The basic information for eleventh grade Reading can be found in Table 19 above. These means represent the LSMs for the different proficiency groups. The difference in LSM between Beginning and Intermediate is -10.27 with a standard error of 1.11 and a t-value of -9.26. For the Beginning to Advanced group, the estimate is -23.56 with a standard error of 1.10 and a t-value of -21.42. From the Beginning to the Fluent group, the estimate is -32.70 with a standard error of 1.06 and a t-value of -30.86. From the Intermediate to Advanced group, the estimate is -13.29

with a standard error of 0.77 and a t-value of -17.19. From the Intermediate to the Fluent group, the estimate is -22.43 with a standard error of 0.72 and a t-value of -31.37. The final group considered was the Advanced to the Fluent group, with an estimate of -9.14 and a standard error of 0.70 and a t-value of -13.04.

Summary of Reading Content Area. Language proficiency category was found to be significant at all grade levels in Reading (Pr > F <.0001) except ninth grade where it was still significant but at 0.0040. In all grades, the language proficiency levels were an indicator of overall performance with the beginning students doing the worst up to the Fluent students doing the best. In all but three grades (eight, ninth, and tenth) the standard deviations were the highest for the Beginning students and got progressively lower until the Fluent level. The largest Estimate value was the category of Beginning to Fluent in all but ninth grade (where there were no Beginning level students). The next largest Estimate values were Beginning to Advanced (six times) and then Intermediate to Fluent (two times). The lowest Estimates were in Advanced to Fluent (five times), Beginning to Intermediate (two times), and Intermediate to Advanced (two times). This data supports the original hypothesis that larger differences would be present in the high-to-low combinations (Beginning to Advance, Beginning to Fluent, and Intermediate to Fluent) and the smaller differences would be the categories next to each other (Beginning to Intermediate, Intermediate to Advanced, and Advanced to Fluent).

Content Area Science

For Science students were given tests in grades four, seven, and then two opportunities in high school. The data will show much smaller numbers in high school since they are not tested every year but rather get two opportunities overall their years. They were also given the KELPA

each of those years. In order to analyze the data, each grade will be evaluated individually since the tests were not equated.

Fourth grade Science. The first grade that is administered both the Science content area test and the KELPA is fourth grade. There were 4,109 KELPA tests administered, and of those 3,991 had a Science score counterpart. In checking the normality of residuals, the MSE of the group was 169.39, with an R-Square of 0.30. A one-way ANOVA was conducted to compare the effect of the Science content assessment score on the KELPA proficiency group. An analysis of variance showed that the effect of the Science content assessment score on the KELPA proficiency category was significant, F (3, 3987) = 562.64, p = .0001. The ANOVA had a MSE of 169.08, and an R-Square of 0.30. There was a coefficient variance of 20.34 and Root MSE of 13.00. The mean for Science was 63.92. Using Brown and Forsythe's Test for Homogeneity of Science Score Variance ANOVA of Absolute Deviations from group Medians the MSE was 61.79. Bartlett's Test for Homogeneity of Science Score Variance had a Chi-Square of 98.16.

Table 20: Fourth Grade Science

Proficiency Level	Number of Participants	Mean	Standard Deviation
Beginning	282	58.56	17.63
Intermediate	1,121	55.39	13.46
Advanced	1,422	64.83	12.66
Fluent	1,166	74.72	11.58

The basic information for fourth grade Science can be found in Table 20 above. These means represent the LSMs for the different proficiency groups. The difference in LSM between Beginning and Intermediate is -6.63 with a standard error of 1.12 and a t-value of -6.08. For the Beginning to Advanced group, the estimate is -16.27 with a standard error of 1.10 and a t-value of -14.77. From the Beginning to the Fluent group, the estimate is -26.16 with a standard error of 1.10 and a t-value of -23.72. From the Intermediate to Advanced group, the estimate is -9.45

with a standard error of 0.52 and a t-value of -18.03. From the Intermediate to the Fluent group, the estimate is -19.33 with a standard error of 0.53 and a t-value of -36.77. The final group considered was the Advanced to the Fluent group, with an estimate of -9.89 and a standard error of 0.48 and a t-value of -20.73.

Seventh grade Science. There were 2,662 KELPA tests administered, and of those 2,586 had a Science score counterpart. In checking the normality of residuals, the MSE of the group was 147.93, with an R-Square of 0.32. A one-way ANOVA was conducted to compare the effect of the Science content assessment score on the KELPA proficiency group. An analysis of variance showed that the effect of the Science content assessment score on the KELPA proficiency category was significant, F (3, 2582) = 414.68, p = .0001. The ANOVA had a MSE of 146.02, and an R-Square of 0.33. There was a coefficient variance of 24.95 and Root MSE of 12.08. The mean for Science was 48.43. Using Brown and Forsythe's Test for Homogeneity of Science Score Variance ANOVA of Absolute Deviations from group Medians the MSE was 54.70. Bartlett's Test for Homogeneity of Science Score Variance had a Chi-Square of 41.23.

Table 21: Seventh Grade Science

Proficiency Level	Number of Participants	Mean	Standard Deviation
Beginning	104	34.30	10.53
Intermediate	695	39.12	10.76
Advanced	1,108	48.15	12.03
Fluent	679	60.60	13.59

The basic information for seventh grade Science can be found in Table 20 above. These means represent the LSMs for the different proficiency groups. The difference in LSM between Beginning and Intermediate is -4.82 with a standard error of 1.11 and a t-value of -4.34. For the Beginning to Advanced group, the estimate is -13.85 with a standard error of 1.09 and a t-value of -12.66. From the Beginning to the Fluent group, the estimate is -26.30 with a standard error of

1.16 and a t-value of -22.74. From the Intermediate to Advanced group, the estimate is -9.03 with a standard error of 0.55 and a t-value of -16.57. From the Intermediate to the Fluent group, the estimate is -21.45 with a standard error of 0.66 and a t-value of -32.44. The final group considered was the Advanced to the Fluent group, with an estimate of -12.45 and a standard error of 0.63 and a t-value of -19.62.

Ninth grade Science. There were 2,263 KELPA tests administered, and of those 577 had a Science score counterpart. There was no check on the normality of residuals for this grade as there was too much variance in the population so adjustments were made to the ANOVA for the fact that there was unequal variance. A one-way ANOVA was conducted to compare the effect of the Science content assessment score on the KELPA proficiency group. An analysis of variance showed that the effect of the Science content assessment score on the KELPA proficiency category was significant, F (3, 573) = 27.74, p = .0001. The ANOVA had a MSE of 257.35, and an R-Square of 0.13. There was a coefficient variance of 34.56 and Root MSE of 16.04. The mean for Science was 46.41. Using Brown and Forsythe's Test for Homogeneity of Science Score Variance ANOVA of Absolute Deviations from group Medians the MSE was 103.4. Bartlett's Test for Homogeneity of Science Score Variance had a Chi-Square of 15.44.

Table 22: Ninth Grade Science

Proficiency Level	Number of Participants	Mean	Standard Deviation
Beginning	6	37.67	14.87
Intermediate	69	36.22	12.26
Advanced	152	40.30	14.43
Fluent	350	51.23	17.32

The basic information for ninth grade Science can be found in Table 20 above. These means represent the LSMs for the different proficiency groups. The difference in LSM between Beginning and Intermediate is 1.45 with a standard error of 6.25 and a t-value of 0.23. For the

Beginning to Advanced group, the estimate is -2.64 with a standard error of 6.18 and a t-value of -0.43. From the Beginning to the Fluent group, the estimate is -13.56 with a standard error of 6.14 and a t-value of -2.21. From the Intermediate to Advanced group, the estimate is -4.09 with a standard error of 1.88 and a t-value of -2.17. From the Intermediate to the Fluent group, the estimate is -15.01 with a standard error of 1.74 and a t-value of -8.62. The final group considered was the Advanced to the Fluent group with an estimate of -10.92 and a standard error of 1.49 and a t-value of -7.32.

Tenth grade Science. There were 1,638 KELPA tests administered, and of those 799 had a Science score counterpart. In checking the normality of residuals, the MSE of the group was 208.13, with an R-Square of 0.12. A one-way ANOVA was conducted to compare the effect of the Science content assessment score on the KELPA proficiency group. An analysis of variance showed that the effect of the Science content assessment score on the KELPA proficiency category was significant, F (3, 795) = 38.06, p = .0001. The ANOVA had a MSE of 206.58, and an R-Square of 0.13. There was a coefficient variance of 30.71 and Root MSE of 14.37. The mean for Science was 46.80. Using Brown and Forsythe's Test for Homogeneity of Science Score Variance ANOVA of Absolute Deviations from group Medians the MSE was 80.47. Bartlett's Test for Homogeneity of Science Score Variance had a Chi-Square of 4.81.

Table 23: Tenth Grade Science

Proficiency Level	Number of Participants	Mean	Standard Deviation
Beginning	11	27.82	9.54
Intermediate	99	38.95	13.21
Advanced	177	41.10	14.06
Fluent	512	50.69	14.77

The basic information for tenth grade Science can be found in Table 20 above. These means represent the LSMs for the different proficiency groups. The difference in LSM between

Beginning and Intermediate is -11.13 with a standard error of 3.17 and a t-value of -3.51. For the Beginning to Advanced group, the estimate is -13.28 with a standard error of 3.06 and a t-value of -4.33. From the Beginning to the Fluent group, the estimate is -22.88 with a standard error of 2.95 and a t-value of -7.76. From the Intermediate to Advanced group, the estimate is -2.15 with a standard error of 1.70 and a t-value of -1.27. From the Intermediate to the Fluent group, the estimate is -11.74 with a standard error of 1.48 and a t-value of -7.94. The final group considered was the Advanced to the Fluent group, with an estimate of -9.60 and a standard error of 1.24 and a t-value of -7.73.

Eleventh grade Science. There were 2,508 KELPA tests administered, and of those 2,084 had a Science score counterpart. In checking the normality of residuals, the MSE of the group was 164.03, with an R-Square of 0.16. A one-way ANOVA was conducted to compare the effect of the Science content assessment score on the KELPA proficiency group. An analysis of variance showed that the effect of the Science content assessment score on the KELPA proficiency category was significant, F (3, 2080) = 131.85, p = .0001. The ANOVA had a MSE of 163.83, and an R-Square of 0.16. There was a coefficient variance of 32.30 and Root MSE of 12.80. The mean for Science was 39.63. Using Brown and Forsythe's Test for Homogeneity of Science Score Variance ANOVA of Absolute Deviations from group Medians the MSE was 62.32. Bartlett's Test for Homogeneity of Science Score Variance had a Chi-Square of 81.30.

Table 24: Eleventh Grade Science

Proficiency Level	Number of Participants	Mean	Standard Deviation
Beginning	88	29.76	9.61
Intermediate	566	32.73	10.83
Advanced	570	39.23	11.93
Fluent	860	45.45	14.69

The basic information for eleventh grade Science can be found in Table 20 above. These means represent the LSMs for the different proficiency groups. The difference in LSM between Beginning and Intermediate is -2.97 with a standard error of 1.12 and a t-value of -2.65. For the Beginning to Advanced group, the estimate is -9.47 with a standard error of 1.14 and a t-value of -8.31. From the Beginning to the Fluent group, the estimate is -15.69 with a standard error of 1.14 and a t-value of -13.76. From the Intermediate to Advanced group, the estimate is -6.50 with a standard error of 0.68 and a t-value of -9.61. From the Intermediate to the Fluent group, the estimate is -12.73 with a standard error of 0.68 and a t-value of -18.80. The final group considered was the Advanced to the Fluent group, with an estimate of -6.23 and a standard error of 0.71 and a t-value of -8.80.

Summary of Science Content Area. Language proficiency category was found to be significant at all grade levels in Science ($Pr > F < .0001$). In all but fourth and ninth grade, the language proficiency levels were an indicator of overall performance with the beginning students doing the worst up to the Fluent students doing the best. In all but ninth grade, the standard deviations were highest for the Beginning students and got progressively lower until the Fluent level. The largest Estimate value was the category of Beginning to Fluent in all but ninth grade. The next largest Estimate values were Intermediate to Fluent (three times) and then Beginning to Advanced (one time). The lowest Estimates were in Beginning to Intermediate (four times) and Intermediate to Advanced (one time). This data supports the original hypothesis that larger differences would be present in the high-to-low combinations (Beginning to Advance, Beginning to Fluent, and Intermediate to Fluent) and the smaller differences would be the categories next to each other (Beginning to Intermediate, Intermediate to Advanced, and Advanced to Fluent).

Research Question 2: What are the relative effects of proficiency level on assessment scores across grade levels? The initial hypothesis was that as the cognitive demands on the content assessment increase, meaning that as grade level increases, the number of low language proficiency students not meeting state standards will become more pronounced. If the null hypothesis were used in this situation, it could be assumed that no difference would be perceptible based solely on proficiency level. This question was answered using proportions that showed how students performed on each content assessment based on grade level and to find out whether there were differences in the proportions of students who did or did not meet/exceed standards across grade levels for each content area separately. All the tables represent the students that meet standards and do not meet standards with the number of each group shown on the column in the appropriate area.

Math Content Area

Looking first at Math, the following tables show how each different proficiency performed on their Math content assessment based on their grade level. Table 25 shows how the Beginning level performed on the Math assessment. Other than ninth grade (which only had two participants), more than half of the students do not meet standards. As illustrated by Table 2, there is a steady increase of students not meeting standards as the grade levels go up. In third grade, 61% are not meeting standards; by fourth grade it is 63%. In fifth grade, it is 72%, then 77% in sixth grade, 80% in seventh grade, and 85% in eighth grade. Ninth grade has only two participants at this level and is being presented for the sake of transparency of data analysis with 50% not meeting standards. Tenth and eleventh grade both have about 96% not meeting standards at this level.

Table 25: Meeting/Not Meeting Standards All Grades Math Beginning Level

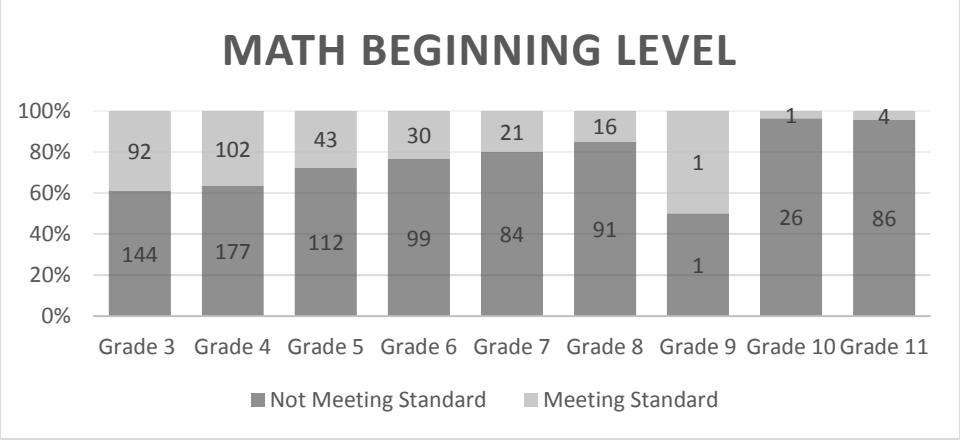


Table 26 shows how the Intermediate proficiency students did on the Math assessment based on their grade. At this level, third, fourth, and fifth grade all have over half their students meeting standards. After that, there is a steady increase in the number of students not meeting standards as can be seen in Table 3. In third grade, 38% are not meeting standards by fourth grade it is 42%. In fifth grade, it is 47%, then 53% in sixth grade, 65% in seventh grade, and 70% in eighth grade. Ninth grade has only twelve participants at this level and is being presented for the sake of transparency of data analysis with 92% not meeting standards in this instance. Tenth grade has 85% and eleventh grade has 83% not meeting standards at this level.

Table 26: Meeting/Not Meeting Standards All Grades Math Intermediate Level

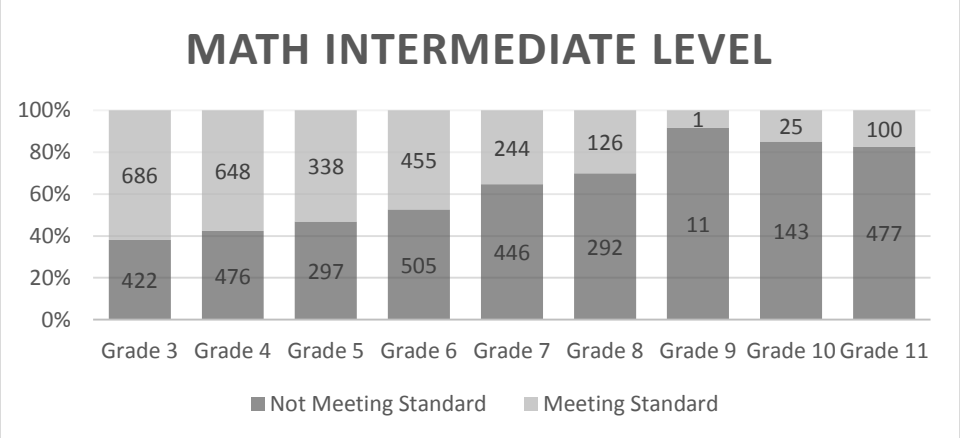


Table 27 shows how the Advanced proficiency students did on the Math assessment, based on their grade. Now more than half the grades have more students meeting standards than not. Third, fourth, fifth, sixth and seventh have less than half their students not meeting standards. As Table 4 illustrates the increase of students failing to meet standards as the grade levels go up. In third grade, 15% are not meeting standards by fourth grade it is 16%. In fifth grade, it is 27%, then 25% in sixth grade, 41% in seventh grade, and 55% in eighth grade. Ninth grade has only 33 participants at this level, which is the smallest sample but fits with the overall pattern thus far with 64% not meeting standards. Tenth has 74% and eleventh grade has 68% not meeting standards at this level.

Table 27: Meeting/Not Meeting Standards All Grades Math Advanced Level

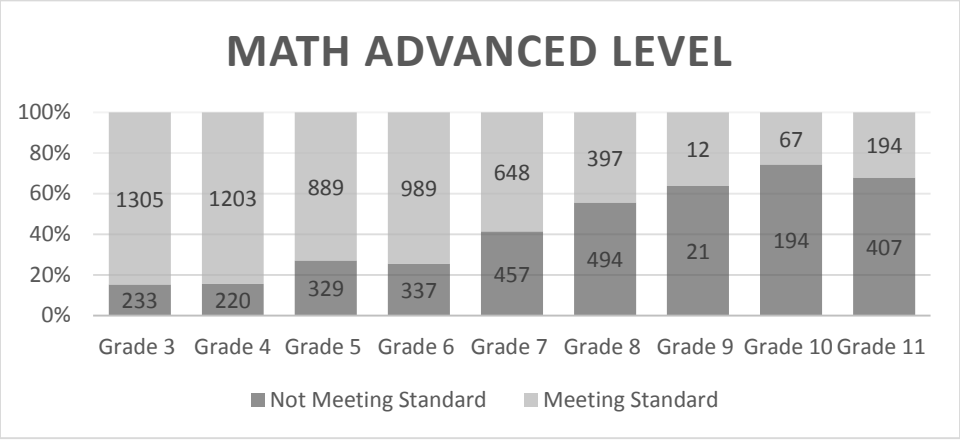
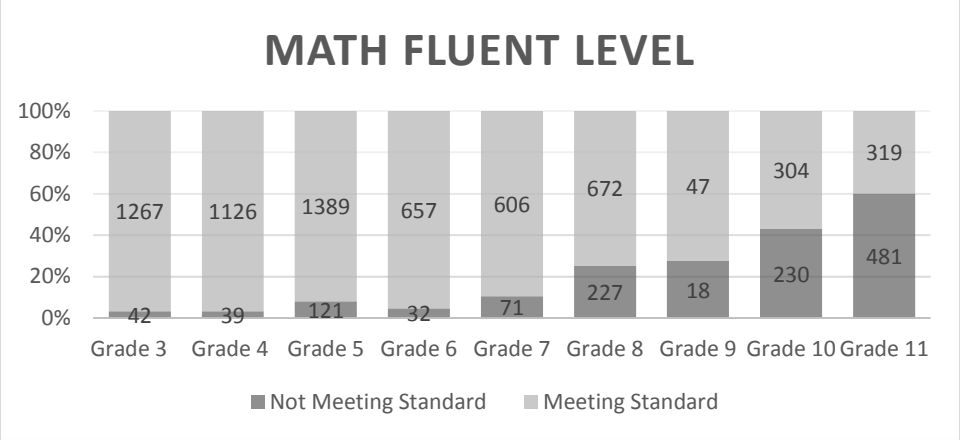


Table 28 shows how the Fluent proficiency students performed on the Math assessment based on their grade. This proficiency level is the first to have only one grade with more than half of its students not meeting standards. In the third and fourth grade, 3% are not meeting standards. In fifth grade, it is 8%, 5% in sixth, 11% in seventh, and 25% in eighth. Ninth grade has a better population this time with 65 total participants and had 28% not meeting standards. Tenth grade had 43% not meeting standards and the only grade to have more than 50% not meeting standards was eleventh at 60%.

Table 28: Meeting/Not Meeting Standards All Grades Math Fluent Level



Summary Math Content Area. This section is summarized in Table 29, which shows how students at the same grade level performed, based on their proficiency.

Table 29: Percentage of Students Not Meeting Standards For Math All Grades

Math	Beginning	Intermediate	Advanced	Fluent
Third	61%	38%	15%	3%
Fourth	63%	42%	16%	3%
Fifth	72%	47%	27%	8%
Sixth	77%	53%	25%	5%
Seventh	80%	65%	41%	11%
Eighth	85%	70%	55%	25%
Ninth	50%	92%	64%	28%
Tenth	96%	85%	74%	43%
Eleventh	96%	83%	68%	60%

Based on this information, it is clear that language proficiency has a profound influence on the Math content score. A Beginning student is much more likely than a Fluent student at any grade level to not meet standards. It is also clear that as the grade level goes up, the difficulty of the tests also increases as can be seen by the increase in the number of students at the different proficiency levels not meeting standards.

Reading Content Area

This section examines the Reading content area. The following tables illustrate how students at each different proficiency level performed on their Reading content assessment,

based on their grade level. Table 30 illustrates how the Beginning proficiency students did on the Reading assessment based on their grade. This proficiency level has low numbers overall with no students in ninth grade and only ten in tenth grade. All grades have over half their students not meeting standards. In third grade, 67% are not meeting standards, 71% in fourth grade, 80% in fifth grade, 76% in sixth grade, 73% in seventh grade, and 83% in eighth grade. There were no students in ninth grade at this level, and only ten in tenth grade, of which 100% did not meet standards. In eleventh grade, 97% did not meet standards.

Table 30: Meeting/Not Meeting Standards All Grades Reading Beginning Level

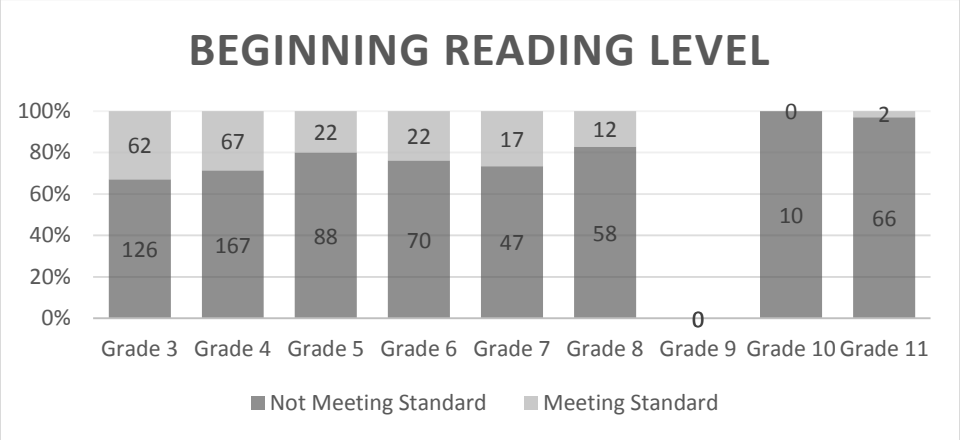


Table 31 shows how the Intermediate proficiency students did on the Reading assessment based on their grade. At this level, ninth grade had only two students but all the other levels had adequate levels. In third grade, 35% of the students did not meet standards, in fourth, 57%, in fifth, 70%, in sixth, 61%, in seventh, 63%, and in eighth, 76%. In ninth, there were only two students so the data is not useable, plus 100% did not meet standards. In tenth grade, 81% did not meet standards, and in eleventh, 94% did not meet standards.

Table 31: Meeting/Not Meeting Standards All Grades Reading Intermediate Level

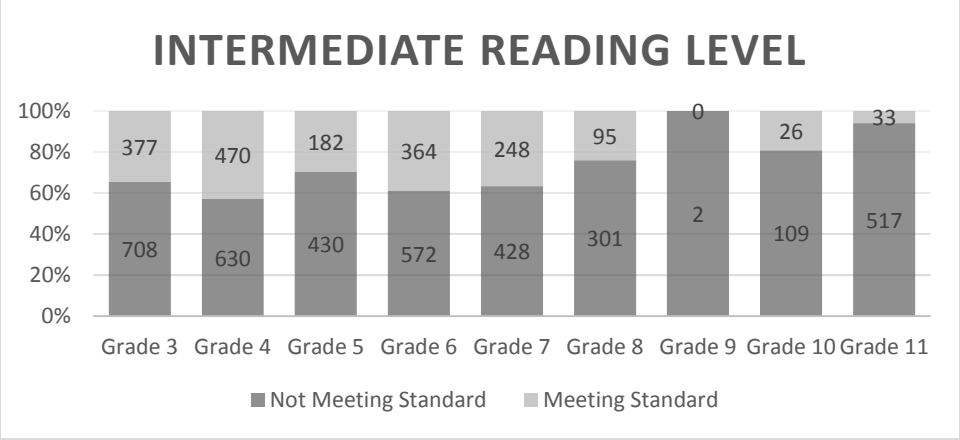


Table 32 shows how the Advanced proficiency students performed on the Reading assessment based on their grade. Again, ninth grade had very low numbers with only eight total students at this level. In third grade, 31% did not meet standards, in fourth, 20%, in fifth, 44%, in sixth, 22%, in seventh, 25%, and in eighth, 46%. In ninth, 75% did not meet standards but again this is only based on eight students. In tenth, 80% and in eleventh 82% did not meet standards.

Table 32: Meeting/Not Meeting Standards All Grades Reading Advanced Level

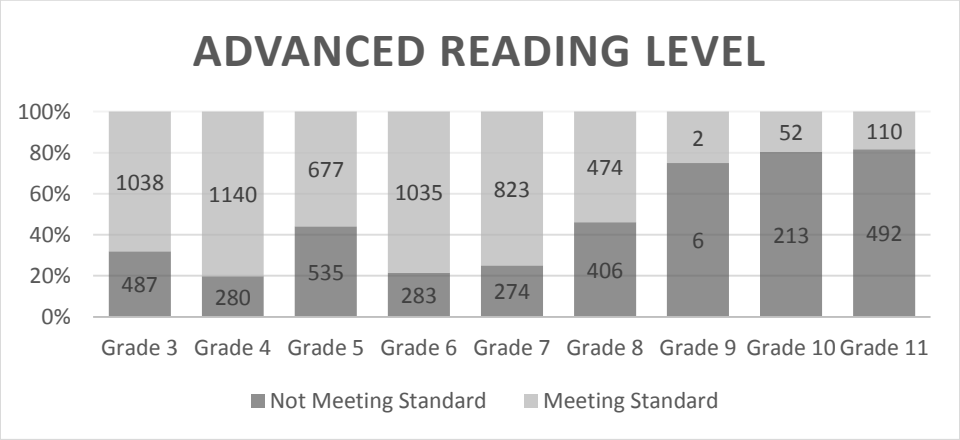
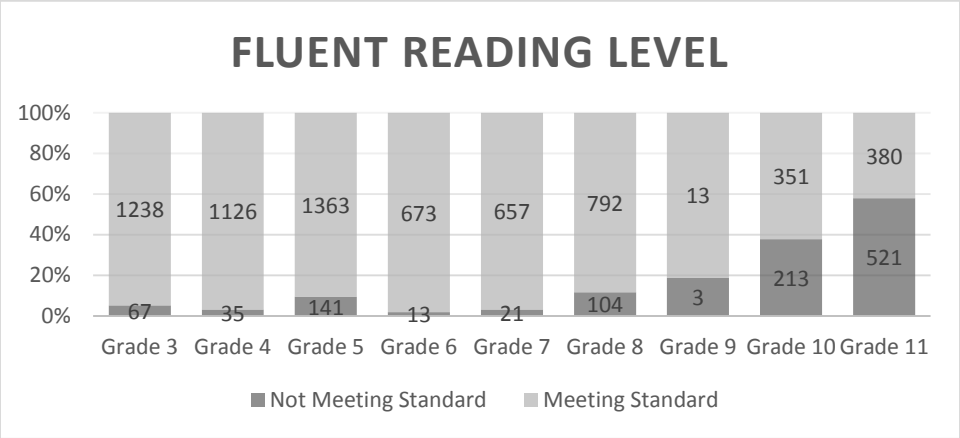


Table 33 shows how the Fluent proficiency students performed on the Reading assessment based on their grade. Again, ninth grade has issues with a low number of participants with only 16 total. All other grades have adequate numbers. In third grade, only one level had more than 50% of students not meeting standards. In third grade, 5% did not meeting standards,

fourth, 3%, fifth, 9%, sixth, 2%, seventh, 3%, and eighth, is 12%. Ninth as previously mentioned has too low of participation to judge but has 23% not meeting standards. In tenth grade, 38% and in eleventh grade, 58% did not meet standards.

Table 33: Meeting/Not Meeting Standards All Grades Reading Fluent Level



Summary Reading Content Area. This section is summarized in Table 34 which shows how students at the same grade level did based on their proficiency.

Table 34: Percentage of Students Not Meeting Standards For Reading All Grades

Reading	Beginning	Intermediate	Advanced	Fluent
Third	67%	35%	32%	5%
Fourth	71%	57%	20%	3%
Fifth	80%	70%	44%	9%
Sixth	76%	61%	22%	2%
Seventh	73%	63%	25%	3%
Eighth	83%	76%	46%	12%
Ninth	0%	100%	75%	23%
Tenth	100%	81%	80%	38%
Eleventh	97%	94%	82%	58%

Based on this information, it seems clear that language proficiency has some influence on the Reading content score.

Science Content Area

This last section looks at the Science content area. The following tables show how each different proficiency group performed on their Science content assessment for their fourth grade and seventh grade tests. The data from high school cannot be analyzed because the data for meeting standards was not included in the data set received. This is due to the Opportunity To Learn (OTL) program that exists at the high school level for the area of Science, and how the data is reported back to the testing agency. The analysis was done using just the fourth and seventh grade, where the data for meeting or not meeting standards was provided.

Table 35 shows how the students did on the Science assessment based on their grade. For fourth grade, 66% of the Beginning level did not meet standards, 37% at the Intermediate level, 13% at the Advanced level, and 2% at the Fluent level. A pattern of increasing performance as the proficiency level of the participants goes up is clear and shows that there is a relationship between the two variables.

Table 35: Meeting/Not Meeting Standards Science Grade Four

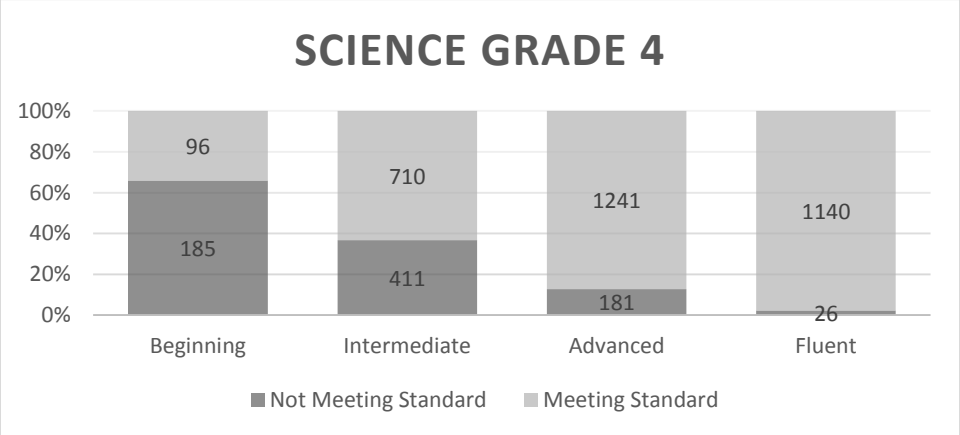
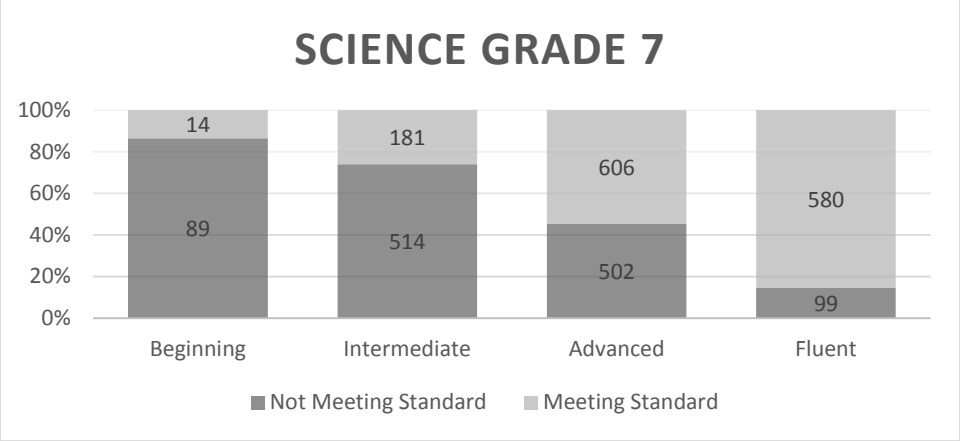


Table 36 shows how the students did on the Science assessment based on their grade. For the seventh grade, 86% of Beginning participants did not meet standards, 74% of Intermediate level, 45% of Advanced level, and 15% of Fluent level. A pattern of increasing performance as

the proficiency level of the participants goes up is clear and shows that there is a relationship between the two variables.

Table 36: Meeting/Not Meeting Standards Science Grade Seven



Summary of Science Content Area. The Science content area posed a major issue for this analysis. The lack of data on how the students performed according to standards for most of the grades made for only two levels that could be analyzed. In those two levels, there is a pattern of the number of students not meeting standards going down as the proficiency level goes up. As the grade went up, the number of students who met standards went down (at the Beginning level from 34% meeting standards in fourth grade to 14% for Beginning level students in seventh grade).

Research Question 3: To what extent does the KELPA predict students' scores on content assessments in Math, Reading, and Science? The initial hypothesis, the null hypothesis, stated that the scores on the KELPA are not a predictor of content area scores in Math, Reading, and Science. A bivariate linear regression analysis was done to predict scores based on equated percent correct content assessment scores. Student level data was analyzed by grade level for each content area separately. The dependent variable for the

set of analyses was the content assessment score and the independent variable was the students' English language total score as determined by the KELPA.

Like the previously discussed ANOVA, the data included a lot of variance, but this time it could not be controlled for as it was with the ANOVA. Due to the high sample sizes in the study, an assumption of normalcy was made using the Central Limit Theorem, the idea that the sampling distributions of means became more normal due to sample sizes. The high variance contributed to an inflated MSE measurement. The results will be divided by content area and grade level, and will be reported in the same manner as the ANOVA results. The number of participants for each grade remained the same as previously reported.

Content Area Math

Math students were given tests every year from third grade until eleventh grade. They were also given the KELPA each of those years. In order to analyze the data, each grade will be evaluated individually since the tests were not equated. This section includes all the grades that took Math, with a description of students' performance based on a linear regression.

Third grade Math. A simple linear regression was calculated to predict the content assessment scores based on the language proficiency. A significant regression equation found ($F(1, 4189) = 2208.47$, $p < .0001$) with an R-Square of 0.35. The Root MSE was 12.03, with a dependent mean of 79.89, and a Coefficient variance of 15.05. The Parameter Estimates for the Intercept were a DF of 1, an estimate of 28.40, Standard Error of 1.11, a t Value of 25.55, and a $Pr > |t|$ of <.0001. For the proficiency category, there was a DF of 1, an Estimate of 0.69, Standard Error of 0.02, a t Value of 46.99, and a $Pr > |t|$ of <.0001.

Fourth grade Math. A simple linear regression was calculated to predict the content assessment scores based on the language proficiency. A significant regression equation found (F

(1, 3989) = 2191.96, p < .0001) with an R-Square of 0.36. The Root MSE was 12.38, with a dependent mean of 72.85, and a Coefficient variance of 16.99. The Parameter Estimates for the Intercept were a DF of 1, an Estimate of 13.98, Standard Error of 1.27, a t Value of 10.98, and a Pr > |t| of <.0001. For the proficiency category, there was a DF of 1, an Estimate of 0.77, Standard Error of 0.02, a t Value of 46.82, and a Pr > |t| of <.0001.

Fifth grade Math. A simple linear regression was calculated to predict the content assessment scores based on the language proficiency. A significant regression equation found (F (1, 3516) = 1616.73, p < .0001), with an R-Square of 0.32. The Root MSE was 12.39, with a dependent mean of 71.36, and a Coefficient variance of 17.36. The Parameter Estimates for the Intercept were a DF of 1, an Estimate of 11.23, Standard Error of 1.51, a t Value of 7.44, and a Pr > |t| of <.0001. For the proficiency category, there was a DF of 1, an Estimate of 0.75, Standard Error of 0.02, a t Value of 40.21, and a Pr > |t| of <.0001.

Sixth grade Math. A simple linear regression was calculated to predict the content assessment scores based on the language proficiency. A significant regression equation found (F (1, 3102) = 1680.84, p < .0001) with an R-Square of 0.35. The Root MSE was 13.60, with a dependent mean of 69.57, and a Coefficient variance of 19.55. The Parameter Estimates for the Intercept were a DF of 1, an Estimate of 4.56, Standard Error of 1.60, a t Value of 2.84, and a Pr > |t| of 0.0045. For the proficiency category, there was a DF of 1, an Estimate of 0.83, Standard Error of 0.02, a t Value of 41.00, and a Pr > |t| of <.0001.

Seventh grade Math. A simple linear regression was calculated to predict the content assessment scores based on the language proficiency. A significant regression equation found (F (1, 2575) = 890.52, p < .0001) with an R-Square of 0.26. The Root MSE was 14.68, with a dependent mean of 59.10, and a Coefficient variance of 24.84. The Parameter Estimates for the

Intercept were a DF of 1, an Estimate of 2.08, Standard Error of 1.93, a t Value of 1.08, and a Pr > |t| of 0.2809. For the proficiency category, there was a DF of 1, an Estimate of 0.72, Standard Error of 0.02, a t Value of 29.84, and a Pr > |t| of <.0001.

Eighth grade Math. A simple linear regression was calculated to predict the content assessment scores based on the language proficiency. A significant regression equation found ($F(1, 2313) = 672.25$, $p < .0001$) with an R-Square of 0.23. The Root MSE was 15.79, with a dependent mean of 58.27, and a Coefficient variance of 27.11. The Parameter Estimates for the Intercept were a DF of 1, an Estimate of 1.32, Standard Error of 2.22, a t Value of 0.60, and a Pr > |t| of 0.55. For the proficiency category, there was a DF of 1, an Estimate of 0.70, Standard Error of 0.03, a t Value of 25.93, and a Pr > |t| of <.0001.

Ninth grade Math. A simple linear regression was calculated to predict the content assessment scores based on the language proficiency. A significant regression equation found ($F(1, 110) = 33.51$, $p < .0001$) with an R-Square of 0.23. The Root MSE was 17.18, with a dependent mean of 55.80, and a Coefficient variance of 30.78. The Parameter Estimates for the Intercept were a DF of 1, an Estimate of -23.92, Standard Error of 13.87, a t Value of -1.73, and a Pr > |t| of 0.0873. For the proficiency category, there was a DF of 1, an Estimate of 0.95, Standard Error of 0.16, a t Value of 5.79, and a Pr > |t| of <.0001.

Tenth grade Math. A simple linear regression was calculated to predict the content assessment scores based on the language proficiency. A significant regression equation found ($F(1, 988) = 293.70$, $p < .0001$) with an R-Square of 0.23. The Root MSE was 15.40, with a dependent mean of 46.96, and a Coefficient variance of 32.79. The Parameter Estimates for the Intercept were a DF of 1, an Estimate of -10.10, Standard Error of 3.37, a t Value of -3.00, and a

Pr > |t| of 0.0028. For the proficiency category, there was a DF of 1, an Estimate of 0.69, Standard Error of 0.04, a t Value of 17.14, and a Pr > |t| of <.0001.

Eleventh grade Math. A simple linear regression was calculated to predict the content assessment scores based on the language proficiency. A significant regression equation found (F (1, 2066) = 263.29, p < .0001) with an R-Square of 0.11. The Root MSE was 14.57, with a dependent mean of 42.32, and a Coefficient variance of 34.42. The Parameter Estimates for the Intercept were a DF of 1, an Estimate of 11.61, Standard Error of 1.92, a t Value of 6.05, and a Pr > |t| of <.0001. For the proficiency category, there was a DF of 1, an Estimate of 0.39, Standard Error of 0.02, a t Value of 16.23, and a Pr > |t| of <.0001.

Summary of Math Content Area. At all grade levels p<.0001 and was found to be significant. This means that the null hypothesis has been rejected and the proficiency level does play a role in the Math content score. The R-Square for these grades was not always the same, so differing amounts of the score are attributed to the fitness of this model. In third grade, the R-Square was 0.35, in fourth, 0.36, in fifth, 0.32, in sixth, 0.35, in seventh, 0.26, in eighth, 0.23, in ninth, 0.23, in tenth, 0.23, and finally in eleventh, 0.11. This means that the model fit the best in the lower grades and became weaker in the higher grades.

Content Area Reading

Reading students were given tests every year from third grade until eleventh grade. They were also given the KELPA each of those years. In order to analyze the data, each grade was evaluated individually since the tests were not equated. This section has all the grades that took Reading, with a description of students' performance based on a linear regression.

Third grade Reading. A simple linear regression was calculated to predict the content assessment scores based on the language proficiency. A significant regression equation found (F

(1, 4101) = 3135.00, p < .0001) with an R-Square of 0.43. The Root MSE was 11.10, with a dependent mean of 71.19, and a Coefficient variance of 15.59. The Parameter Estimates for the Intercept were a DF of 1, an Estimate of 10.47, Standard Error of 1.10, a t Value of 9.53, and a Pr > |t| of <.0001. For the proficiency category, there was a DF of 1, an Estimate of 0.81, Standard Error of 0.02, a t Value of 55.99, and a Pr > |t| of <.0001.

Fourth grade Reading. A simple linear regression was calculated to predict the content assessment scores based on the language proficiency. A significant regression equation found (F (1, 3913) = 3679.62, p < .0001) with an R-Square of 0.49. The Root MSE was 10.29, with a dependent mean of 73.21, and a Coefficient variance of 14.06. The Parameter Estimates for the Intercept were a DF of 1, an Estimate of 4.80, Standard Error of 1.14, a t Value of 4.21, and a Pr > |t| of <.0001. For the proficiency category, there was a DF of 1, an Estimate of 0.89, Standard Error of 0.02, a t Value of 60.66, and a Pr > |t| of <.0001.

Fifth grade Reading. A simple linear regression was calculated to predict the content assessment scores based on the language proficiency. A significant regression equation found (F (1, 3436) = 2993.56, p < .0001) with an R-Square of 0.47. The Root MSE was 11.03, with a dependent mean of 70.56, and a Coefficient variance of 15.62. The Parameter Estimates for the Intercept were a DF of 1, an Estimate of -10.62, Standard Error of 1.50, a t Value of -7.10, and a Pr > |t| of <.0001. For the proficiency category, there was a DF of 1, an Estimate of 1.00, Standard Error of 0.02, a t Value of 54.71, and a Pr > |t| of <.0001.

Sixth grade Reading. A simple linear regression was calculated to predict the content assessment scores based on the language proficiency. A significant regression equation found (F (1, 3030) = 3012.31, p < .0001) with an R-Square of 0.50. The Root MSE was 11.39, with a dependent mean of 68.64, and a Coefficient variance of 16.59. The Parameter Estimates for the

Intercept were a DF of 1, an Estimate of -11.12, Standard Error of 1.48, a t Value of -7.58, and a Pr > |t| of <.0001. For the proficiency category, there was a DF of 1, an Estimate of 1.01, Standard Error of 0.02, a t Value of 54.88, and a Pr > |t| of <.0001.

Seventh grade Reading. A simple linear regression was calculated to predict the content assessment scores based on the language proficiency. A significant regression equation found (F (1, 2513) = 2682.01, p < .0001) with an R-Square of 0.52. The Root MSE was 10.81, with a dependent mean of 67.95, and a Coefficient variance of 15.90. The Parameter Estimates for the Intercept were a DF of 1, an Estimate of -14.48, Standard Error of 1.61, a t Value of -9.02, and a Pr > |t| of <.0001. For the proficiency category, there was a DF of 1, an Estimate of 1.03, Standard Error of 0.02, a t Value of 51.79, and a Pr > |t| of <.0001.

Eight grade Reading. A simple linear regression was calculated to predict the content assessment scores based on the language proficiency. A significant regression equation found (F (1, 2240) = 1898.72, p < .0001) with an R-Square of 0.56. The Root MSE was 12.44, with a dependent mean of 65.53, and a Coefficient variance of 18.98. The Parameter Estimates for the Intercept were a DF of 1, an Estimate of -20.96, Standard Error of 2.00, a t Value of -10.47, and a Pr > |t| of <.0001. For the proficiency category, there was a DF of 1, an Estimate of 1.05, Standard Error of 0.02, a t Value of 43.57, and a Pr > |t| of <.0001.

Ninth grade Reading. A simple linear regression was calculated to predict the content assessment scores based on the language proficiency. A significant regression equation found (F (1, 24) = 13.76, p 0.0011) with an R-Square of 0.36. The Root MSE was 16.56, with a dependent mean of 62.19, and a Coefficient variance of 26.63. The Parameter Estimates for the Intercept were a DF of 1, an Estimate of -77.11, Standard Error of 37.69, a t Value of -2.05, and a Pr > |t|

of 0.0519. For the proficiency category, there was a DF of 1, an Estimate of 1.60, Standard Error of 0.43, a t Value of 3.71, and a Pr > |t| of 0.0011.

Tenth grade Reading. A simple linear regression was calculated to predict the content assessment scores based on the language proficiency. A significant regression equation found (F (1, 972) = 592.81, p <.0001) with an R-Square of 0.38. The Root MSE was 13.62, with a dependent mean of 61.75, and a Coefficient variance of 22.06. The Parameter Estimates for the Intercept were a DF of 1, an Estimate of -30.43, Standard Error of 3.81, a t Value of -7.98, and a Pr > |t| of <.0001. For the proficiency category, there was a DF of 1, an Estimate of 1.09, Standard Error of 0.05, a t Value of 24.35, and a Pr > |t| of <.0001.

Eleventh grade Reading. A simple linear regression was calculated to predict the content assessment scores based on the language proficiency. A significant regression equation found (F (1, 2119) = 1355.10, p <.0001) with an R-Square of 0.39. The Root MSE was 12.88, with a dependent mean of 54.83, and a Coefficient variance of 23.48. The Parameter Estimates for the Intercept were a DF of 1, an Estimate of -10.24, Standard Error of 1.79, a t Value of -5.72, and a Pr > |t| of <.0001. For the proficiency category, there was a DF of 1, an Estimate of 0.82, Standard Error of 0.02, a t Value of 26.81, and a Pr > |t| of <.0001.

Summary of Reading Content Area. At all grade levels p<.0001, which was found to be significant. This means that the null hypothesis has been rejected and the proficiency level does play a role in the Reading content score. The R-Square for these grades was not always the same, so differing amounts of the score are attributed to the fitness of this model. In third grade, the R-Square was 0.43, in fourth, 0.49, in fifth, 0.47, in sixth, 0.50, in seventh, 0.52, in eighth, 0.56, in ninth, 0.36, in tenth, 0.38, and finally in eleventh, 0.39. This means that the model fit the best in the lower grades and became weaker in the higher grades.

Content Area Science

Science students were given tests in fourth, seventh, and twice in grades nine through eleven. They were also given the KELPA each of those years. In order to analyze the data, each grade was evaluated individually since the tests were not equated. This section has all the grades that took Science with a description of students' performance based on a linear regression.

Fourth grade Science. A simple linear regression was calculated to predict the content assessment scores based on the language proficiency. A significant regression equation found ($F(1, 3989) = 1798.11$, $p < .0001$) with an R-Square of 0.31. The Root MSE was 12.88, with a dependent mean of 63.92, and a Coefficient variance of 20.15. The Parameter Estimates for the Intercept were a DF of 1, an estimate of 8.79, Standard Error of 1.32, a t Value of 6.67, and a Pr > |t| of <.0001. For the proficiency category, there was a DF of 1, an Estimate of 0.72, Standard Error of 0.02, a t Value of 42.40, and a Pr > |t| of <.0001.

Seventh grade Science. A simple linear regression was calculated to predict the content assessment scores based on the language proficiency. A significant regression equation found ($F(1, 2584) = 1006.77$, $p < .0001$) with an R-Square of 0.28. The Root MSE was 12.47, with a dependent mean of 48.43, and a Coefficient variance of 25.76. The Parameter Estimates for the Intercept were a DF of 1, an estimate of -3.00, Standard Error of 1.64, a t Value of -1.83, and a Pr > |t| of 0.0672. For the proficiency category, there was a DF of 1, an Estimate of 0.65, Standard Error of 0.02, a t Value of 31.73, and a Pr > |t| of <.0001.

Ninth grade Science. A simple linear regression was calculated to predict the content assessment scores based on the language proficiency. A significant regression equation found ($F(1, 575) = 80.47$, $p < .0001$) with an R-Square of 0.12. The Root MSE was 16.05, with a dependent mean of 46.42, and a Coefficient variance of 34.58. The Parameter Estimates for the

Intercept were a DF of 1, an estimate of -5.73, Standard Error of 5.85, a t Value of -0.98, and a Pr > |t| of 0.33. For the proficiency category, there was a DF of 1, an Estimate of 0.62, Standard Error of 0.07, a t Value of 8.97, and a Pr > |t| of <.0001.

Tenth grade Science. A simple linear regression was calculated to predict the content assessment scores based on the language proficiency. A significant regression equation found (F (1, 797) = 129.80, p < .0001) with an R-Square of 0.14. The Root MSE was 14.24, with a dependent mean of 46.80, and a Coefficient variance of 30.42. The Parameter Estimates for the Intercept were a DF of 1, an estimate of 0.67, Standard Error of 4.08, a t Value of 0.16, and a Pr > |t| of 0.87. For the proficiency category, there was a DF of 1, an Estimate of 0.54, Standard Error of 0.05, a t Value of 11.39, and a Pr > |t| of <.0001.

Eleventh grade Science. A simple linear regression was calculated to predict the content assessment scores based on the language proficiency. A significant regression equation found (F (1, 2082) = 382.02, p < .0001) with an R-Square of 0.16. The Root MSE was 12.83, with a dependent mean of 39.63, and a Coefficient variance of 32.37. The Parameter Estimates for the Intercept were a DF of 1, an estimate of 7.33, Standard Error of 1.68, a t Value of 4.37, and a Pr > |t| of <.0001. For the proficiency category, there was a DF of 1, an Estimate of 0.41, Standard Error of 0.02, a t Value of 19.55, and a Pr > |t| of <.0001.

Summary of Science Content Area. At all grade levels p<.0001, which was found to be significant. This means that the null hypothesis has been rejected and the proficiency level does play a role in the Science content score. The R-Square for these grades was not always the same, so differing amounts of the score are attributed to the fitness of this model. In fourth grade the R-Square was 0.31, in seventh, 0.28, in ninth, 0.12, in tenth, 0.14, and finally in eleventh, 0.16.

This means that the model fit the best in the lower grades and became weaker in the higher grades.

General Discussion of all Areas

For all the grades and content areas, the regression was significant Pr > F = <.0001. This means that for all content areas, the null hypothesis was rejected and the English language proficiency level does significantly influence content assessment score. The R-square values were not even across grades, with the model fitting Reading the best. Math and Science saw smaller R-square values. All content areas had smaller R-square values in the higher grades, meaning the model explained the variance in the lower grades better.

Research Question 4: What role do other demographic variables (such as Free and Reduced Lunch, Native Language, Gender, Length of Time in the U.S., or Exceptionality Code) play in student achievement on content assessments for ELLs? The initial hypothesis was that some variables reflect a positive relationship with student achievement (Length of Time in the U.S.), no relationship with student achievement (Gender and First Language), or a negative relationship with student achievement (Free and Reduced Lunch and Exceptionality Code). The analysis for this question will be a set of multiple linear regression analysis. The dependent variable is the content assessment score and the independent variables are the students' proficiency group and each of the various demographic variables (Gender; Eligibility for National School Lunch Program; Exceptionality Code; First Language; and Number of Years in the US).

Demographic Variables and Their Coding

Gender (reported as "Gender") is the first demographic variable and was already coded when the data was received. A female was coded as a "zero" and a Male as a "one". Eligibility

for National School Lunch Program (reported as lunch) was originally coded as; Blank meaning not eligible, "one" eligible for reduced price lunch, and "two" meaning eligible for free lunch. The data was recoded for this study to group free and reduced together (Abedi, 2001), with a "zero" for not eligible and a "one" for eligible for Free and Reduced Lunch as a combined category. Exceptionality Code (reported as except) was the next demographic and was a bit more complicated. The original data had a primary and secondary code system. Table 37 shows all the different coding in the original data.

Table 37: Original Exceptionaility Coding

- Blank = None
- AM = Autism
- DB = Deaf/blindness
- DD = Developmentally delayed (ages 3-9 only)
- ED = Emotional disturbance
- HI = Hearing impairment
- LD = Specific learning disability
- MD = Multiple disabilities
- MR = Mental retardation
- OH = Other health impairment
- OI = Orthopedic impairment
- SL = Speech/language disability
- TB = Traumatic brain injury
- VI = Visual impairment

The only other category that was coded was Gifted, which was coded as a "GI". For this study being identified as having an Individualized Education plan (IEP) was the primary focus, with all those without IEPs grouped into one "none" category. This means that Learning Disabled, Gifted, and all the other coding options in Table 37, except "blank" for none, were grouped together as those with IEPs. Those with IEPs were coded as "zero" while those with no IEPs were coded as "one". The next demographic variable was the First Language (reported as "lang") of the individual. Table 38 shows all the different coding in the original data.

Table 38: Original First Language Coding

- Blank=English
- 1 = Chinese (Mandarin or Cantonese)
- 2 = Dinka (Sudanese)
- 3 = French
- 4 = German (High or Low)
- 5 = Hmong
- 6 = Khmer (Cambodian)
- 7 = Korean
- 8 = Lao
- 10 = Philippine or Tagalog (Philippine)
- 11 = Russian
- 13 = Spanish
- 14 = Vietnamese
- 15 = Arabic
- 16 = Other
- 17 = Somali
- 18 = Thai
- 19 = Portuguese
- 20 = Farsi (Iranian)
- 21 = Chuukese (Marshall Island/ Micronesian)
- 22 = Bosnian
- 23 = Burmese
- 24 = Hindi
- 25 = Urdu
- 26 = Swahili
- 27 = Nepali
- 28 = American Sign Language (ASL)
- 29 = Serb
- 30 = Croatian
- 31 = Turkish
- 32 = Karen languages (Burma/Myanmar)
- 33 = Haitian/Haitian Creole

These were recoded to combine all non-Spanish speakers together in an "other" category and then Spanish speakers. The top language was Spanish which was coded as "zero". All other languages were added together and grouped as "other" which was coded as "one". The reason for doing this is the size of the Spanish speaking population in the data. Over eighty percent of the population is Spanish speaking and doing any other combination would allow the size of the population to influence the analysis even more. The final demographic variable that was examined was the number of years (reported as "years") the individual had been in the United States. For this, the US entry date was subtracted from the generic date of April 30, 2010, which was the last date they could take their tests that year, and an approximate number of years in the United States were the result. The number was reported in whole years 0–18.

The other variable that is reported in this section is Total Proficiency Category (reported as "totalcat"). This represents the proficiency category of Beginning, coded as "one", Intermediate, coded as "two", Advanced, coded as "three", or Fluent, coded as "four". While this

has been looked at in previous questions as a dependent variable, it is now also considered a demographic variable.

The Analysis

The first analysis was done with just one demographic variable, and a second analysis was done to see if any two-way interaction of variables was significant. A Type III Sums of Square was used to examine the demographic variables. All demographic variables were run though the test (all individuals along with all pair options).

First, a look at the overall performance. Each instance when a demographic variable was identified as being significant (Pr > F of 5% or less) in a Type III Sums of Square analysis, was compiled. This was done for each content area (Math, Reading, and Science). All grades were grouped by content area. The overall predictor quality was described using this information and the totals of significance across all content areas. For this study high predictor quality was anything identified 100–70% of the time, Medium was 69–30% of the time, Low was 29–1% of the time, and none meant that there were no instances where that demographic information was found to be significant. This system was created by the researcher as a way of explaining predictor quality. It is important to note that Math and Reading have more grades tested so the percentages will look different when compared to Science for the same number of instance. Math and Reading both have nine grade levels, and Science has only five grade levels that were tested. Table 39 shows the single demographic variables that were found to be significant, separated by content area, and with a total overall percent as well. As the table shows, only one demographic variable had a high percentage of predictability, and that was Total Proficiency Category, which was significant 96% of the time. This variable was significant in all but Reading at the ninth

grade. The single worst demographic variable for predictability was Eligibility for Free and Reduced Lunch, with only 17% significance overall.

Table 39: Single Demographic Variables Significance

Type III SS with (Pr > F) of less than 5%					
Demographic Names	Math % all grades	Reading % all grades	Science % all grades	Total % of all	Over-all Predictor Quality
One Way Relationships					
totalcat	100%	89%	100%	96%	High
years	35%	11%	63%	32%	Medium
except	0%	56%	20%	26%	Low
lang	57%	0%	0%	22%	Low
gender	46%	0%	20%	22%	Low
lunch	11%	22%	20%	17%	Low

Table 40 illustrates the interaction of demographic variables that were found to be significant. They are also separated by the content area with a final column that contains the overall percentage of significance. For the pair relationships, no interaction was found to have a High significance, (over 70%), but there were three pairs that had a Medium significance, which were Total Category and Exceptionality, at 57%; First Language and Total Category, at 43%; and Number of Years in the U.S. and Total Category, also at 43%. Of the pair relationship, Total Category and Exceptionality was the best relationship.

Table 40: Two-Way Demographic Variables Significance

Type III SS with (Pr > F) of less than 5%					
Demographic Names	Math % all grades	Reading % all grades	Science % all grades	Total % of all	Over-all Predictor Quality
Two Way Relationships					
totalcat*except	33%	78%	60%	57%	Medium
years*totalcat	47%	47%	46%	47%	Medium
lang*totalcat	57%	24%	63%	45%	Medium
lunch*lang	56%	0%	20%	26%	Low
gender*except	24%	24%	23%	23%	Low
years*except	0%	57%	0%	22%	Low
lang*except	11%	24%	22%	19%	Low
lunch*gender	13%	24%	20%	19%	Low
years*lang	11%	12%	43%	19%	Low
gender*totalcat	22%	11%	20%	17%	Low
lang*gender	25%	0%	20%	14%	Low
lunch*totalcat	24%	0%	20%	14%	Low
years*lunch	0%	13%	40%	14%	Low
years*gender	11%	13%	0%	9%	Low
lunch*except	11%	11%	0%	9%	Low

The next section will show tables for each different demographic variable that shows all three content areas and grades. The tables also include the Estimate, Pr > |t| value and the R-Square for each grade if it was significant. The tables are presented in the order of how significant they were found to be overall, the same order as the previous two tables, 39 and 40. The final five interactions do not have a table because they are significant in very few instances. They will be summarized after the last of the tables. Ninth grade is being included for the sake of completeness and is being included in percentages; but it needs to be noted that ninth grade did not represent even numbers of the proficiency levels and had population size issues. So while it is being included for clarity it is not to be used for decision making.

Table 41 shows the Total Proficiency Category, which represents the language proficiency of the test takers. This was significant 96% of the time. It was significant in all but

one grade in Reading (ninth). The table shows that this variable was very significant in predicting the participants' scores. Table 41 shows how English proficiency category influences student scores. The table is broken down into grades, the different proficiency categories, and the content areas (Math, Reading, and Science). For example, in the case of seventh grade, a Beginning student would be about forty-two points lower than a Fluent student in Math, fifty-one points lower in Reading, and forty points lower in Science. An Intermediate seventh grade student would be about twenty points lower than a Fluent student in Math, twenty-nine points lower in Reading, and twenty-eight points lower in Science. An Advanced seventh grade student would be about nine points lower than a Fluent student in Math, fourteen points lower in Reading, and sixteen points lower in Science.

Table 41: Demographic Variable: Total Language Proficiency Category

Total Proficency Category (Estimate Received by each proficiency group per chart)									
	Math			**Reading**			**Science**		
	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square
Grade 3 Beginning	-30.3889	<.0001	0.32	-42.6522	<.0001	0.43			
Grade 3 Intermediate	-13.4962	<.0001	0.32	-24.0753	<.0001	0.43			
Grade 3 Advanced	-4.3460	0.0192	0.32	-9.8146	<.0001	0.43			
Grade 3 Fluent	Control	Control	0.32	Control	Control	0.43			
Grade 4 Beginning	-38.1914	<.0001	0.35	-45.6657	<.0001	0.46	-40.2812	<.0001	0.34
Grade 4 Intermediate	-13.8751	<.0001	0.35	-20.0877	<.0001	0.46	-18.6887	<.0001	0.34
Grade 4 Advanced	-6.8194	0.0007	0.35	-7.6826	<.0001	0.46	-7.6939	0.0002	0.34
Grade 4 Fluent	Control	Control	0.35	Control	Control	0.46	Control	Control	0.34
Grade 5 Beginning	-40.0363	<.0001	0.33	-49.0161	<.0001	0.45			
Grade 5 Intermediate	-12.7469	<.0001	0.33	-26.9467	<.0001	0.45			
Grade 5 Advanced	-5.4270	0.0070	0.33	-12.3863	<.0001	0.45			
Grade 5 Fluent	Control	Control	0.33	Control	Control	0.45			
Grade 6 Beginning	-41.3025	<.0001	0.35	-52.2994	<.0001	0.47			
Grade 6 Intermediate	-23.6822	<.0001	0.35	-29.6755	<.0001	0.47			
Grade 6 Advanced	-10.8578	<.0001	0.35	-10.9222	<.0001	0.47			
Grade 6 Fluent	Control	Control	0.35	Control	Control	0.47			
Grade 7 Beginning	-41.8925	<.0001	0.33	-50.6069	<.0001	0.50	-38.9506	<.0001	0.39
Grade 7 Intermediate	-20.3662	<.0001	0.33	-28.8189	<.0001	0.50	-28.051	<.0001	0.39
Grade 7 Advanced	-8.5614	0.0008	0.33	-14.1649	<.0001	0.50	-15.7622	<.0001	0.39
Grade 7 Fluent	Control	Control	0.33	Control	Control	0.50	Control	Control	0.39
Grade 8 Beginning	-39.6693	<.0001	0.31	-48.1419	<.0001	0.47			
Grade 8 Intermediate	-18.6716	<.0001	0.31	-34.0354	<.0001	0.47			
Grade 8 Advanced	-11.0260	<.0001	0.31	-15.6911	<.0001	0.47			
Grade 8 Fluent	Control	Control	0.31	Control	Control	0.47			
Grade 9 Beginning	-46.7972	0.0147	0.47				-27.2193	0.0962	0.20
Grade 9 Intermediate	-49.4952	0.0147	0.47				-25.7293	<.0001	0.20
Grade 9 Advanced	-17.2141	0.3258	0.47				-17.8058	0.0015	0.20
Grade 9 Fluent	Control	Control	0.47				Control	Control	0.20
Grade 10 Beginning	-31.5814	<.0001	0.32	-37.9769	0.0122	0.42	-29.9675	0.0734	0.19
Grade 10 Intermediate	-24.7426	<.0001	0.32	-33.3017	<.0001	0.42	-19.4897	0.0005	0.19
Grade 10 Advanced	-8.5210	0.0116	0.32	-15.9345	<.0001	0.42	-8.4353	0.042	0.19
Grade 10 Fluent	Control	Control	0.32	Control	Control	0.42	Control	Control	0.19
Grade 11 Beginning	-29.7903	<.0001	0.21	-35.5914	<.0001	0.41	-18.9342	<.0001	0.23
Grade 11 Intermediate	-9.9161	<.0001	0.21	-24.8965	<.0001	0.41	-17.3687	<.0001	0.23
Grade 11 Advanced	2.6851	0.2898	0.21	-11.8261	<.0001	0.41	-7.3576	0.0008	0.23
Grade 11 Fluent	Control	Control	0.21	Control	Control	0.41	Control	Control	0.23

Table 42 shows the Number Years in the U.S., which was significant 30% of the time. It was significant in three grades in Science (seventh, eighth, and eleventh), three grades in Math

(fifth, seventh, and eighth), and one grade in Reading (eleventh). The table shows that this variable was significant in predicting the participants score in Math and Science, but it did not predict well in Reading. The estimates would lower the score in Math the longer the student has been in the U.S. There were only a few instances of positive influence (eleventh grade in both Reading and Science).

Table 42: Demographic Variable: Number of Years in the U.S.

Number of Years in the U.S. (Estimate Received by multiplying number of years)									
	Math			**Reading**			**Science**		
	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square
Grade 3									
Grade 4									
Grade 5	-0.3411	0.3374	0.33						
Grade 6									
Grade 7	-0.5977	0.0834	0.33				-0.5878	0.0391	0.39
Grade 8	-0.4145	0.1799	0.31				-0.1673	0.7808	0.20
Grade 9									
Grade 10									
Grade 11				0.2578	0.2720	0.41	0.4997	0.0330	0.23

Table 43 shows the Exceptionality demographic, which was significant 26% of the time. It was significant in one grade in Science (Seventh), no grades in Math, and it was most significant in Reading, at 56% of the time (third, fourth, fifth, sixth, and eighth). The table shows that this variable was very significant in predicting the participants score in the lower grades in Reading, and it was a positive relationship. Those students with IEPs in the lower grades performed better than those without an IEP in Reading. There was no influence on Math scores and very little on Science.

Table 43: Demographic Variable: Exceptionality

Exceptionality (Estimate received by those with an IEP)									
	Math			**Reading**			**Science**		
	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square
Grade 3				4.1103	0.1495	0.43			
Grade 4				3.5387	0.2340	0.46			
Grade 5				13.8880	<.0001	0.45			
Grade 6				12.3410	0.0056	0.47			
Grade 7							12.0841	0.0009	0.39
Grade 8				1.7099	0.6940	0.47			
Grade 9									
Grade 10									
Grade 11									

Table 44 shows the First Language, which was significant 22% of the time. It was not significant in any grade in Science or Reading. The table shows that this variable was significant in predicting the participants score in Math, 56% of the time, but showed no relationship with Reading or Science. It also seemed better able to predict in the middle grade levels in Math (fifth, sixth, seventh, eighth, and ninth). The estimate is always negative meaning that Spanish speaker's scores would be lowered by the estimated amount, doing worse than speakers of other languages.

Table 44: Demographic Variable: First Language

First Language (Estimate received by Spanish Speakers)									
	Math			**Reading**			**Science**		
	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square
Grade 3									
Grade 4									
Grade 5	-1.7059	0.3866	0.33						
Grade 6	-2.0669	0.3905	0.35						
Grade 7	-7.3903	0.0022	0.33						
Grade 8	-11.6277	<.0001	0.31						
Grade 9	-9.0101	0.0046	0.32						
Grade 10									
Grade 11									

Table 45 shows the Gender Category, which was also significant 22% of the time. It was significant in one grade in Science (seventh), four grades in Math (fourth, eighth, ninth, and eleventh), and no grades in Reading. The table shows that this variable was significant in predicting the participants' scores, in Math, in the higher grades. In all but one instance the estimate is negative, lowering girls' scores, other than in eighth grade Math.

Table 45: Demographic Variable: Gender

Gender (Estimate received by Girls)									
	Math			**Reading**			**Science**		
	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square
Grade 3									
Grade 4	-4.0670	0.0160	0.35						
Grade 5									
Grade 6									
Grade 7							-10.1598	<.0001	0.39
Grade 8	2.6064	0.2629	0.31						
Grade 9	-20.4876	0.0445	0.47						
Grade 10									
Grade 11	-4.2913	0.0489	0.21						

Table 46 shows the Free and Reduced Lunch Program Eligibility Category, which was significant 17% of the time. This was the worst single demographic variable for predicting. It was significant in one grade in Science (eleventh), one grade in Math (eleventh), and two grades in Reading (third and eleventh). The table shows that this variable was not very significant in predicting the participants score in most grades in all content areas. This was an entirely positive relationship, meaning those that do not receive Free and Reduced Lunch have higher scores that those that do, in the grades where significance was found.

Table 46: Demographic Variable: Free and Reduced Lunch Eligibility

Free and Reduced Lunch Program Eligibility (Estimate received by those not eligible for Free and Reduced Lunch)									
	Math			**Reading**			**Science**		
	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square
Grade 3				3.8286	0.0539	0.43			
Grade 4									
Grade 5									
Grade 6									
Grade 7									
Grade 8									
Grade 9									
Grade 10									
Grade 11	11.8726	<.0001	21%	2.0648	0.3759	0.41	8.3353	0.0003	0.23

Table 47 shows the first pair of demographic variables, Exceptionality and Total Proficiency Category, which was significant 57% of the time. It was significant in three grades in Science (fourth, seventh, and eleventh), three grades in Math (third, fourth, and fifth), and seven grades in Reading (third, fourth, fifth, sixth, eighth, tenth, and eleventh). The table shows that this variable was very significant in predicting the participants score. It was better at lower levels in Reading and Math and most grades in Science. At lower proficiency levels it was often a positive relationship, meaning that Beginning students would have their scores improved by having an IEP. As English proficiency level increased the scores were influenced negatively, meaning the scores were reduced by having an IEP.

Table 47: Demographic Variables: Exceptionality and Total Language Proficiency Category

Exceptionality * Total Category (Estimate received by those with IEPs per Total Proficiency Category)									
	Math			**Reading**			**Science**		
	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square
Grade 3 Beginning	6.6463	0.0194	0.32	18.5145	<.0001	0.43			
Grade 3 Intermediate	-2.0139	0.3871	0.32	9.5776	<.0001	0.43			
Grade 3 Advanced	-4.3108	0.0949	0.32	-1.1346	0.6295	0.43			
Grade 3 Fluent	Control	Control	0.32	Control	Control	0.43			
Grade 4 Beginning	13.5378	<.0001	0.35	17.2126	<.0001	0.46	10.3450	0.0002	0.34
Grade 4 Intermediate	3.6270	0.1238	0.35	5.0245	0.0119	0.46	1.8371	0.4411	0.34
Grade 4 Advanced	1.2675	0.6278	0.35	-1.3634	0.5369	0.46	-1.6349	0.5365	0.34
Grade 4 Fluent	Control	Control	0.35	Control	Control	0.46	Control	Control	0.34
Grade 5 Beginning	11.5753	0.0042	0.33	5.4739	0.1399	0.45			
Grade 5 Intermediate	2.1639	0.3707	0.33	4.1686	0.0577	0.45			
Grade 5 Advanced	-3.2031	0.1856	0.33	-2.0555	0.3496	0.45			
Grade 5 Fluent	Control	Control	0.33	Control	Control	0.45			
Grade 6 Beginning				-1.5816	0.7366	0.47			
Grade 6 Intermediate				1.2020	0.6940	0.47			
Grade 6 Advanced				-4.9937	0.1220	0.47			
Grade 6 Fluent				Control	Control	0.47			
Grade 7 Beginning							-3.1699	0.0511	0.39
Grade 7 Intermediate							-3.4371	0.2125	0.39
Grade 7 Advanced							-7.6394	0.0082	0.39
Grade 7 Fluent							Control	Control	0.39
Grade 8 Beginning				17.4528	0.0026	0.47			
Grade 8 Intermediate				9.2665	0.0016	0.47			
Grade 8 Advanced				1.0001	0.7258	0.47			
Grade 8 Fluent				Control	Control	0.47			
Grade 9 Beginning									
Grade 9 Intermediate									
Grade 9 Advanced									
Grade 9 Fluent									
Grade 10 Beginning				-26.6158	0.532	0.42			
Grade 10 Intermediate				16.5462	0.0002	0.42			
Grade 10 Advanced				2.5145	0.5342	0.42			
Grade 10 Fluent				Control	Control	0.42			
Grade 11 Beginning				10.7912	0.1016	0.41	19.9645	0.0020	0.23
Grade 11 Intermediate				6.8900	0.0056	0.41	7.044	0.0065	0.23
Grade 11 Advanced				0.8084	0.7611	0.41	2.7885	0.3015	0.23
Grade 11 Fluent				Control	Control	0.41	Control	Control	0.23

Table 48 shows the pair of Total Proficiency Category and Number of Years in the U.S., which was significant 47% of the time. It was significant in two grades in Science (ninth and eleventh), four grades in Math (fourth, fifth, sixth, and tenth), and four grades in Reading (third,

sixth, seventh and eleventh). The table shows that this variable was significant in predicting the participants score for all three content areas evenly. The relationship is mostly negative in Math and Science, but Reading at the lower proficiency levels is mostly positive.

Table 48: Demographic Variables: Total Language Proficiency Category and Number of Years in the U.S.

Total Category * Number of Years in the U.S. (Estimate received for each Year in the U.S. and Total Proficiency Category)									
	Math			**Reading**			**Science**		
	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square
Grade 3 Beginning				0.9633	0.1009	0.43			
Grade 3 Intermediate				-0.5856	0.1134	0.43			
Grade 3 Advanced				-0.1074	0.7571	0.43			
Grade 3 Fluent				Control	Control	0.43			
Grade 4 Beginning	-1.0317	0.0305	0.35						
Grade 4 Intermediate	-1.1211	0.0015	0.35						
Grade 4 Advanced	-0.2722	0.4345	0.35						
Grade 4 Fluent	Control	Control	0.35						
Grade 5 Beginning	-0.7395	0.2501	0.33						
Grade 5 Intermediate	-1.2901	0.0001	0.33						
Grade 5 Advanced	-0.4959	0.0906	0.33						
Grade 5 Fluent	Control	Control	0.33						
Grade 6 Beginning	1.4746	0.0308	0.35	2.7329	<.0001	0.47			
Grade 6 Intermediate	-0.1606	0.6436	0.35	0.6591	0.0318	0.47			
Grade 6 Advanced	-0.3820	0.2702	0.35	-0.0825	0.7855	0.47			
Grade 6 Fluent	Control	Control	0.35	Control	Control	0.47			
Grade 7 Beginning				1.7581	0.0073	0.50			
Grade 7 Intermediate				-0.0448	0.8671	0.50			
Grade 7 Advanced				-0.1460	0.5518	0.50			
Grade 7 Fluent				Control	Control	0.50			
Grade 8 Beginning									
Grade 8 Intermediate									
Grade 8 Advanced									
Grade 8 Fluent									
Grade 9 Beginning							-45.8654	0.0089	0.20
Grade 9 Intermediate							0.6300	0.3510	0.20
Grade 9 Advanced							0.5840	0.2614	0.20
Grade 9 Fluent							Control	Control	0.20
Grade 10 Beginning	-0.7264	0.7462	0.32						
Grade 10 Intermediate	1.1519	0.0059	0.32						
Grade 10 Advanced	-0.1193	0.6958	0.32						
Grade 10 Fluent	Control	Control	0.32						
Grade 11 Beginning				1.1640	0.0439	0.41	-1.0124	0.0642	0.23
Grade 11 Intermediate				0.5464	0.0082	0.41	-0.3307	0.1213	0.23
Grade 11 Advanced				0.0898	0.6348	0.41	-0.4126	0.0298	0.23
Grade 11 Fluent				Control	Control	0.41	Control	Control	0.23

Table 49 shows the pair of Total Language Proficiency Category and First Language, which was significant 45% of the time. It was significant in three grades in Science (fourth, seventh and eleventh), five grades in Math (fourth, fifth, seventh, eighth, and eleventh), and only two grades in Reading (third and eleventh). The table shows that this variable was significant in predicting the participants score for Science and Math the best. For Science the relationship is a positive one improving Spanish speaking students' scores, with the largest gains for the Beginning proficiency level. In Math, Beginning students' scores were also improved the most and always positively, but the other proficiency groups had both positive and negative relationships. In Reading, in third grade it is an entirely positive influence, but in eleventh grade it is negative at the lower levels with only Advanced students improving their scores.

Table 49: Demographic Variables: Total Language Proficiency Category and First Language

Total Category * Language (Estimate received by Spanish Speakers per Total Proficiency Category)									
	Math			**Reading**			**Science**		
	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square
Grade 3 Beginning				2.2559	0.4202	0.43			
Grade 3 Intermediate				3.8829	0.0053	0.43			
Grade 3 Advanced				0.2998	0.8045	0.43			
Grade 3 Fluent				Control	Control	0.43			
Grade 4 Beginning	10.2690	<.0001	0.35				10.5289	<.0001	0.34
Grade 4 Intermediate	1.0041	0.5294	0.35				2.4685	0.1267	0.34
Grade 4 Advanced	0.4218	0.7578	0.35				0.7523	0.5872	0.34
Grade 4 Fluent	Control	Control	0.35				Control	Control	0.34
Grade 5 Beginning	7.5111	0.0089	0.33						
Grade 5 Intermediate	1.1028	0.5607	0.33						
Grade 5 Advanced	-1.6313	0.2554	0.33						
Grade 5 Fluent	Control	Control	0.33						
Grade 6 Beginning									
Grade 6 Intermediate									
Grade 6 Advanced									
Grade 6 Fluent									
Grade 7 Beginning	8.3020	0.0236	0.33				10.1481	0.0007	0.39
Grade 7 Intermediate	-0.7115	0.7553	0.33				3.6765	0.0502	0.39
Grade 7 Advanced	-1.9668	0.2938	0.33				3.7656	0.0145	0.39
Grade 7 Fluent	Control	Control	0.33				Control	Control	0.39
Grade 8 Beginning	11.1267	0.0034	0.31						
Grade 8 Intermediate	0.5285	0.8587	0.31						
Grade 8 Advanced	-0.5931	0.7786	0.31						
Grade 8 Fluent	Control	Control	0.31						
Grade 9 Beginning									
Grade 9 Intermediate									
Grade 9 Advanced									
Grade 9 Fluent									
Grade 10 Beginning									
Grade 10 Intermediate									
Grade 10 Advanced									
Grade 10 Fluent									
Grade 11 Beginning	8.9664	0.0228	0.21	-1.8829	0.6280	0.41	5.7297	0.1030	0.23
Grade 11 Intermediate	0.7160	0.7558	0.21	-2.3623	0.2240	0.41	5.3729	0.008	0.23
Grade 11 Advanced	-4.9445	0.0404	0.21	4.7558	0.0212	0.41	4.5657	0.0292	0.23
Grade 11 Fluent	Control	Control	0.21	Control	Control	0.41	Control	Control	0.23

At this point, there is a shift in the overall percentages of significance. The rest of the demographic pair relationships are less than 30% significant overall. Rather than discussing the

grades and content areas that were not significant now, the areas that were found significant will be discussed.

Table 50 shows the pair of First Language and eligibility for Free and Reduced Lunch, which was significant 26% of the time. It was significant in only one grade in Science (seventh), five grades in Math (fifth-ninth), and no grades in Reading. The table shows that this variable was significant in predicting the participants score in the middle grade levels of Math the best. The relationship was entirely negative other than ninth grade (which had insufficient data). This means that Spanish speakers with no eligibility for Free and Reduced Lunch did worse overall than those that had eligibility or were speakers of another language.

Table 50: Demographic Variables: First Language and Free and Reduced Lunch Eligibility

First Language * Free and Reduced Lunch Eligibility (Estimate received by Spanish Speakers with no Free and Reduced Lunch)									
	Math			**Reading**			**Science**		
	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square
Grade 3									
Grade 4									
Grade 5	-6.5439	<.0001	0.33						
Grade 6	-4.7767	0.0082	0.35						
Grade 7	-4.6844	0.0152	0.33				-4.0093	0.0120	0.39
Grade 8	-6.5830	0.0057	0.31						
Grade 9	42.071	0.0104	0.47						
Grade 10									
Grade 11									

Table 51 shows the pair of Exceptionality and Gender, which was significant 23% of the time. It was significant in only one grade in Science (fourth), two grades in Math (fourth and tenth), and three grades in Reading (fourth, eighth, and tenth). The table shows no true predictability pattern other than all areas were significant for fourth grade. At the lower grade levels the relationship was negative, but both instances in tenth grade were positive. This means

that in elementary and middle school girls with IEPs would do worse than their non-IEP peers and boys.

Table 51: Demographic Variables: Exceptionality and Gender

Exceptionality * Gender (Estimate received by Girls with IEPs)									
	Math			**Reading**			**Science**		
	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square
Grade 3									
Grade 4	-3.4853	0.0215	0.35	-3.4639	0.0075	0.46	-3.2247	0.0352	0.34
Grade 5									
Grade 6									
Grade 7									
Grade 8				-0.3324	0.8564	0.47			
Grade 9									
Grade 10	9.0125	0.0192	0.32	7.3067	0.0304	0.42			
Grade 11									

Table 52 shows the pair of Exceptionality and Number of Years in the U.S., which was significant 22% of the time. It was significant in no grades in Science and Math, and four grades in Reading (third, fifth, sixth, and eleventh). The table shows that this variable was not a significant predictor in Math and Science, but was significant 57% of the time for Reading. In elementary school the influence was negative, indicating that those with IEPs scores would be reduced by the Number of Years in the U.S. The only instance that was positive was in eleventh grade.

Table 52: Demographic Variables: Exceptionality and Number of Years in the U.S.

Exceptionality * Number of Years in the U.S. (Estimate received based on the Number of Years in the U.S. with IEPs)									
	Math			**Reading**			**Science**		
	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square
Grade 3				-1.1795	0.0135	0.43			
Grade 4									
Grade 5				-1.3546	0.0016	0.45			
Grade 6				-1.3242	0.0004	0.47			
Grade 7									
Grade 8									
Grade 9									
Grade 10									
Grade 11				0.5355	0.0499	0.41			

Table 53 shows the pair of Exceptionality and First Language, which was significant 19% of the time. It was significant in only one grade in Science (eleventh), one grade in Math (eight), and two grades in Reading (eight and eleventh). The table shows that this variable was not a significant predictor in most cases. The two times it is significant in eight grade are both positive, indicating that those with IEPs that are Spanish speakers would have on average better scores than their peers. In eleventh grade the opposite is true, with those with IEPs and Spanish speaking having lower scores than their peers.

Table 53: Demographic Variables: Exceptionality and First Language

Exceptionality * Language (Estimate Received by those having an IEP and Spanish Speaking)									
	Math			**Reading**			**Science**		
	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square
Grade 3									
Grade 4									
Grade 5									
Grade 6									
Grade 7									
Grade 8	11.5790	0.0037	0.31	6.9031	0.0414	0.47			
Grade 9									
Grade 10									
Grade 11				-8.6732	0.0139	0.41	-7.8870	0.0242	0.23

Table 54 shows the pair of eligibility for Free and Reduced Lunch and Gender, which was significant 19% of the time. It was significant in only one grade in Science (fourth), one grade in Math (third), and two grades in Reading (eighth and eleventh). In Reading and Science the relationship was positive, meaning that girls who are not eligible for Free and Reduced Lunch would have better scores that those who are eligible. In Math it was a negative relationship, indicating that the score would go down for girls who are not eligible.

Table 54: Demographic Variables: Free and Reduced Lunch Eligibility and Gender

Lunch * Gender (Estimate received by Girls who are Not Eligible for Free and Reduced Lunch)									
	Math			**Reading**			**Science**		
	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square
Grade 3	-2.7793	0.0368	0.32						
Grade 4							3.3535	0.0173	0.34
Grade 5									
Grade 6									
Grade 7									
Grade 8				4.2028	0.8140	0.47			
Grade 9									
Grade 10									
Grade 11				6.1290	0.0009	0.41			

Table 55 shows the pair of First Language and Number of Years in the U.S., which was significant 19% of the time. It was significant in only one grade in Math (tenth), one grade in Reading (eleventh), and two grades in Science (tenth and eleventh). In tenth grade the relationship was positive in both instances, meaning that scores would be improved by the number of years in the U.S. for Spanish speakers. In eleventh grade the relationship was negative in both instances, meaning that scores would be reduced by the number of years in the U.S. for Spanish speakers.

Table 55: Demographic Variables: First Language and Number of Years in the U.S.

Language * Number of Years in the U.S. **(Estimate received by Spanish Speakers based on the Number of Years in the U.S.)**									
	Math			**Reading**			**Science**		
	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square
Grade 3									
Grade 4									
Grade 5									
Grade 6									
Grade 7									
Grade 8									
Grade 9									
Grade 10	1.0667	0.0023	0.32				0.8448	0.0338	0.19
Grade 11				-0.4944	0.0229	0.41	-0.5283	0.0171	0.23

Table 56 shows the pair of Gender and Total Proficiency Category, which was significant 17% of the time. It was significant in only one grade in Reading (eleventh), one grade in Science (seventh), and two grades in Math (third and fifth). For all Beginning level students the relationship was positive, meaning that girls' scores were improved compared to the Fluent students. In all but Science the Advanced girls' scores were reduced compared to the Fluent students.

Table 56: Demographic Variables: Total Language Proficiency Category and Gender

Total Category * Gender (Estimate Received by Girls per Total Proficiency Category)									
	Math			**Reading**			**Science**		
	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square
Grade 3 Beginning	1.5417	0.4172	0.32						
Grade 3 Intermediate	-2.5784	0.0143	0.32						
Grade 3 Advanced	-2.0358	0.0311	0.32						
Grade 3 Fluent	Control	Control	0.32						
Grade 4 Beginning									
Grade 4 Intermediate									
Grade 4 Advanced									
Grade 4 Fluent									
Grade 5 Beginning	7.6371	0.0013	0.33						
Grade 5 Intermediate	0.4412	0.7292	0.33						
Grade 5 Advanced	-0.2448	0.8012	0.33						
Grade 5 Fluent	Control	Control	0.33						
Grade 6 Beginning									
Grade 6 Intermediate									
Grade 6 Advanced									
Grade 6 Fluent									
Grade 7 Beginning							5.8595	0.0280	0.39
Grade 7 Intermediate							6.3584	<.0001	0.39
Grade 7 Advanced							3.8399	0.0008	0.39
Grade 7 Fluent							Control	Control	0.39
Grade 8 Beginning									
Grade 8 Intermediate									
Grade 8 Advanced									
Grade 8 Fluent									
Grade 9 Beginning									
Grade 9 Intermediate									
Grade 9 Advanced									
Grade 9 Fluent									
Grade 10 Beginning									
Grade 10 Intermediate									
Grade 10 Advanced									
Grade 10 Fluent									
Grade 11 Beginning				0.4132	0.9135	0.41			
Grade 11 Intermediate				2.9652	0.0469	0.41			
Grade 11 Advanced				-2.3340	0.0946	0.41			
Grade 11 Fluent				Control	Control	0.41			

The rest of the demographic variables were significant less than 15% of the time and will be briefly described. First Language and Gender was only significant three times and had an overall significance 14% of the time. Third grade Math had an Estimate of -2.5617, a Pr > |t| of

0.0227, and an R-Square of 0.32. Fourth grade Math had an Estimate of 2.2816, a Pr > |t| of 0.0497, and an R-Square of 0.35. The other instance was in eleventh grade Science which had an Estimate of -4.1687, a Pr > |t| of 0.0102, and an R-Square of 0.23. The Estimate influenced the score of girls who are Spanish speakers. In two instances (third grade Math and eleventh grade Science) those students' scores were lowered. In fourth grade Math those students' scores were increased.

Table 57 shows the pair of eligibility for Free and Reduced Lunch and Total Proficiency Category, which was only significant three times and had an overall significance of 14% of the time. The table has been reduced to only show the grades where significance was found. There were no instances of significance in Reading, only one grade in Science (fourth), and two grades in Math (tenth and eleventh). This was both a positive and negative influence depending on content and proficiency level as can be seen in Table 57. This indicates that this interaction is not significant nor predictable in how it influences the population.

Table 57: Demographic Variables: Total Language Proficiency Category and Free and Reduced Lunch Eligibility

Total Category * Lunch (Estimate received by those not eligible for Free and Reduced Lunch per Total Proficiency Category)									
	Math			**Reading**			**Science**		
	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square	Estimate	Pr > |t|	R-Square
Grade 4 Beginning							-8.1090	0.0273	0.34
Grade 4 Intermediate							3.2269	0.1052	0.34
Grade 4 Advanced							-0.7312	0.6476	0.34
Grade 4 Fluent							Control	Control	0.34
Grade 10 Beginning	-13.5013	0.1064	0.32						
Grade 10 Intermediate	-4.1093	0.3173	0.32						
Grade 10 Advanced	-8.4071	0.0088	0.32						
Grade 10 Fluent	Control	Control	0.32						
Grade 11 Beginning	14.1890	0.0396	0.21						
Grade 11 Intermediate	-8.9297	0.0008	0.21						
Grade 11 Advanced	-15.1281	<.0001	0.21						
Grade 11 Fluent	Control	Control	0.21						

Number of Years in the U.S. and eligibility for Free and Reduced Lunch was only significant three times and had an overall significance 14% of the time. There were no instances of significance in Math. Eighth grade Reading had an Estimate of 0.6426, a Pr > |t| of 0.0374, and an R-Square of 0.47. Tenth grade Science had an Estimate of 1.2587, a Pr > |t| of 0.0003, and an R-Square of 0.19. The other instance was in eleventh grade Science which had an Estimate of -0.6876, a Pr > |t| of 0.0047, and an R-Square of 0.23. The Estimate influenced the score of those that have no eligibility for Free and Reduced Lunch based on the Number of Years in the U.S. Eleventh grade was the only grade to have a negative influence, meaning that those with no Free and Reduced Lunch would have lower scores than their peers.

The following two pairs had 9% overall significance. Number of Years in the U.S. and Gender was only significant two times. Eighth grade Math had an Estimate of -0.6751, a Pr > |t| of 0.0046, and an R-Square of 0.31. The other instance was in fifth grade Reading which had an Estimate of 0.5156, a Pr > |t| of 0.0270, and an R-Square of 0.45. Overall, this was not a good predictor of student scores. Eligibility for Free and Reduced Lunch and Exceptionality was only significant two times as well. The first instance was fourth grade Math with an Estimate of 6.1466, a Pr > |t| of 0.0118, and an R-Square of 0.35. The other instance was in eleventh grade Reading, which had an Estimate of 10.6283, a Pr > |t| of 0.0007, and an R-Square of 0.41. This was a positive relationship for both instances, meaning those students with IEPs and no Free and Reduced Lunch eligibility did better than their peers. This interaction was not a good predictor of student performance.

Summary of Findings

Statistical analysis were performed on the test data with the purpose of determining what areas influenced or could predict an individual's scores on their content assessments (Math,

Reading, and Science). Four research questions guided the data analysis. The statistical measures used were ANOVAs, proportions, and simple linear regressions.

In the following and final chapter, these findings will be discussed in relation to the literature review and theoretical framework. The limitations of the present research will also be presented as well as suggestions for future studies. Finally, implications will be discussed and how they could influence future research.

Chapter 5: Discussion

In an effort to comply with the federal government's accountability requirements (Title I and Title III), English Language Learners (ELLs) in Kansas must display progress in academic English language proficiency (as measured by the KELPA), and in academic content area achievement (as measured by the CETE), through skill-specific tests for Math, Reading, and Science.

This study evaluated the relationship between the performance of ELLs on the KELPA and their grade-required content assessments, and evaluated the predictive power of the language proficiency of the students, their grade level, their exceptionality or disability qualification, the number of years they have been in the U.S., their eligibility for the Free and Reduced Lunch program, their Native Language or first language, their Gender, and all the various two-way combinations of these demographic variables. To accomplish this, multiple ANOVAs, simple linear regressions, and basic proportions were performed on an extent dataset from the entire state of Kansas during the 2009–2010 school year (testing was conducted in the spring of 2010). All students who took the KELPA were part of the original dataset, but only pairs containing a KELPA score and a content (Math, Reading, or Science) score were analyzed.

Key findings suggest that student performances on the KELPA have a significant relationship with the students' performance during the same year on their Reading, Math, and Science content assessments. Each grade had to be individually analyzed, as the original tests were not equated, but similar patterns are seen across the grade levels. In addition, many of the demographic variables (Number of Years in the U.S., Total Language Proficiency Category, Total Language Proficiency Category and Exceptionality Code, Number of Years in the U.S. and

Total Language Proficiency Category, and First Language and Total Language Proficiency Category) were found to have predictive power in content area scores.

To illustrate how important it is to view ELLs performance through the lens of language proficiency, if we were to take the total number of those who met standards and compared them to those who did not meet standards, 66% met standards for Math and 62% met standards for Reading. This does not show the great fluctuation within this group based on proficiency. Therefore, it is important to remember to view the results through the lens of language proficiency when possible. For Kansas, this means having four different lenses (Beginning, Intermediate, Advanced, and Fluent) rather than grouping all ELLs as a single subgroup.

The discussion of the findings begins with a description of the ELLs who were part of the study, the outcomes for the Math, Reading, and Science assessments for the ELLs, the KELPA's predictive power on content assessment scores, the effects of proficiency level on content scores across grade levels, and then the role of demographic variables on content assessments. Implications of the validity of testing are discussed. Recommendations for interested and involved parties will be made, followed by a discussion of the limitations of this study. Finally, the findings are discussed in relation to previous literature and future research.

Discussion of Findings

The ELLs who were part of this study were students in grades three through eleven in the state of Kansas and had taken the KELPA and at least one content assessment (Math, Reading, and/or Science) during the 2009–2010 school year. Table 58 shows the number of students at each grade level who were administered the KELPA as well as a column for each of the content areas (Math, Reading, and Science).

Table 58: Number of students that were administered a test 2009-2010

Grade	KELPA	Math	Reading	Science
Third	4300	4191	4103	N/A
Fourth	4109	3991	3915	3991
Fifth	3619	3518	3438	N/A
Sixth	3174	3104	3032	N/A
Seventh	2662	2577	2515	2586
Eighth	2390	2315	2242	N/A
Ninth	2263	112	26	577
Tenth	1638	990	990	799
Eleventh	2508	2068	2121	2084
Totals	26663	22866	22382	10037

All ELLs have to take the KELPA every year of their attendance, including their first year. They are also expected to take the content assessments every year (or every required year), which are reported for accountability. The only exception is during the first year, where students take the Math and Science assessments, but the scores do not count for accountability. After the first year, they take all grade-required tests and the scores do count toward AYP. The total size of this population who took the KELPA in grades three through eleven for the 2009–2010 school year was 26,663 students. There were 22,866 who took the KELPA and the Math assessment of the state, 22,382 who took the KELPA and the Reading assessment of the state, and 10,037 who took the KELPA and the state's Science assessment.

For Math, there were 1,130 students at the Beginning level. Of those students, 310 met standards and 820 did not meet standards for Math, which is equivalent to 27% of all Beginning level students meeting standards in Math. For the Intermediate level, there were 5,692 students. Of those students, 2,623 met standards and 3,069 did not meet standards for Math, which is equivalent to 48% of all Intermediate level students meeting standards in Math. For the Advanced level, there were 8,396 students. Of those students, 5,704 met standards and 2,692 did not meet standards, which is equivalent to 68% of all Advanced students meeting standards in

Math. For the Fluent level, there were 7,648 students. Of those students, 6,387 met standards and 1,261 did not meet standards for Math, which is equivalent to 84% of all Fluent level students meeting standards in Math. The students were analyzed based on their grade level and their language proficiency, but it is clear that language proficiency makes a difference in a students' ability to meet the standards for their level in Math.

For Reading, there were 836 students at the Beginning level. Of those students, 204 met standards and 632 did not meet standards for Reading, which is equivalent to 32%of all Beginning level students meeting standards in Reading. For the Intermediate level, there were 5,492 students. Of those students, 1,795 students met standards and 3,697 students did not meet standards for Reading, which is equivalent to 33% of all Intermediate level students meeting standards in Reading. For the Advanced level, there were 8,327 students. Of those students, 5,351 met standards and 2,976 did not meet standards for Reading, which is equivalent to 64% of all Advanced level students meeting standards in Reading. For the Fluent level, there were 7,711 students. Of those students, 6,593 students met standards and 1,118 did not meet standards, which is equivalent to 86% of all Fluent students meeting standards on Reading. The students were analyzed based on their grade level and language proficiency level, but it is clear that language proficiency makes a difference in a student's ability to meet the standards for their level in Reading.

Results for Science are difficult to discuss in this way, as there is no data on how high school students performed against the standards. The only grades that have that data are fourth and seventh. For the two grades, there were 384 Beginning level students. Of those, 110 met standards and 274 did not meet standards, which is equivalent to 29% of all fourth and seventh grade Beginning level students meeting standards in Science. For the Intermediate level, there

were 1,816 students. Of those, 891 met standards and 925 did not meet standards for Science, which is equivalent to 49% of all fourth and seventh grade Intermediate level students meeting standards in Science. For the Advanced level, there were 2,530 students. Of those, 1,847 met standards and 683 did not meet standards for Science, which is equivalent to 73% of all fourth and seventh grade Advanced level students meeting standards in Science. For the Fluent level, there were 1,845 students. Of those, 1,720 met standards and 125 did not meet standards for Science, which is equivalent to 93% of all fourth and seventh grade Fluent level students meeting standards in Science.

The other piece of information that we have about this population is related to the demographic variables that were looked at in the fourth research question. It is important to note that the demographic variables should be interpreted with caution. There were not equal amounts of participants in each grade and proficiency level, which created difficulties in interpretation. The way the demographic variables were coded for analysis was also not ideal. Some had to be grouped together to try to make the analysis more statistically meaningful (First Language and Exceptionality Code). The single variables are their Exceptionality Code or IEP classification, the Number of Years they have been in the U.S., their eligibility for the Free and Reduced Lunch program, their Native Language or first language, their Gender, and their Total Language Proficiency Category. For Exceptionality, 2,098 or 7.7% of the population was indicated as learning disabled, 78 or 0.3% was indicated as gifted, 749 or 2.8% was indicated as some other disability code (see Table 37 for a complete list of all other coded options), and the last group of 23,738 or 89% of the students had no indicated exceptionality code at all. For this analysis all those identified as having an IEP (learning disabled, gifted, or other disability code) were grouped together. The group of students with an IEP had 2,925 students or about 10.8% of

the population. For the number of years in the U.S., detailed information can be found in Table 59, which shows the number of years from zero, or less than a full year, to eighteen, broken down by grade.

Table 59: Demographic Variable: Number of Years in the U.S. by grade

Years	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Tenth	Eleventh
0	137	139	146	119	119	101	165	112	176
1	168	153	143	118	122	115	161	146	197
2	235	213	130	126	120	111	124	129	311
3	1564	197	165	120	121	106	108	97	181
4	1309	1429	239	186	157	152	127	93	217
5	527	1160	1230	156	131	100	108	71	140
6	201	497	952	1068	183	134	133	94	163
7	46	194	387	735	792	136	129	93	118
8	37	30	117	349	538	740	130	96	100
9	28	21	20	109	232	416	596	79	119
10	1	28	13	17	77	179	324	335	66
11	0	3	25	9	4	20	80	184	423
12	0	0	2	18	7	1	16	31	158
13	0	0	0	7	24	17	3	10	50
14	0	0	0	0	2	23	4	4	11
15	0	0	0	0	0	0	12	8	1
16	0	0	0	3	0	0	1	10	5
17	0	0	0	2	0	1	0	3	2
18	0	0	0	0	0	0	0	2	1

The next demographic variable is their eligibility for the Free and Reduced Lunch program, which overall had an 88% participation among this population. Detailed information can be found in Table 60, which has a breakdown of each grade and their eligibility.

Table 60: Demographic Variable: Eligibility for Free and Reduced Lunch

Grade	Number of Students Eligible	Percentage of Population
Third	3,805	~88%
Fourth	3,659	~89%
Fifth	3,217	~89%
Sixth	2,829	~89%
Seventh	2,357	~89%
Eighth	2,139	~89%
Ninth	1,977	~87%
Tenth	1,329	~81%
Eleventh	2,066	~82%

First language has already been described in detail in Chapter 3 in the "discussion of the participants" section. The single largest group was the Spanish speakers, which accounted for about 81% of the total population. This study looked specifically at Spanish speakers and then grouped all other languages into an 'other' category. The last demographic variable was the Gender of the participants. Overall, there was a little over half the population that was male (53%). Table 61 shows the exact information as well as the percentage of the population that is male for each grade, as well as overall.

Table 61: Demographic Variable: Gender by grade

	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Tenth	Eleventh	Total all Grades
Male	2212	2173	1900	1651	1378	1279	1263	922	1357	14135
Female	2088	1936	1719	1523	1284	1111	1000	716	1151	12528
Total	4300	4109	3619	3174	2662	2390	2263	1638	2508	26663
% of Male	51%	53%	53%	52%	52%	54%	56%	56%	54%	53%

The demographic information allowed the research to look at how these different variables performed during testing to see if there were any differences. The scores were analyzed using this demographic information as well as the grade level and total language proficiency level of the students. Pairs were also made of the different demographic variables, and were analyzed to see if having membership in both demographic groups influenced scores differently than not having membership.

The outcomes of Kansas content area assessments for Mathematics, Reading, and Science for ELLs

The general outcomes of the ELLs that took content assessments were that language proficiency made a difference in a students' ability to meet standards on their content assessments. The language proficiency category was significant at all grade levels in all content areas ($Pr > F < .0001$), except ninth grade Reading, which was 0.0040 and still significant. There were only three times when language proficiency was not an indicator of overall student performance (ninth grade Math, fourth grade Science, and ninth grade Science). Overall, the Beginning level students did the worst on their content assessments, and the scores for the students went up on their content assessment scores as their language proficiency level went up, with Fluent students performing the best on their content assessments. Interestingly, standard deviations also were influenced by the language proficiency. In all but eighth, ninth, and tenth grade Reading, and ninth grade Math and Science, the standard deviations were highest for Beginning level students and got lower as the levels went up with Fluent students performing the most similarly (having the lowest standard deviations).

The largest Estimate value was the category of Beginning to Fluent in all but ninth grade in all content areas. The next largest estimate values were Beginning to Advanced (twelve times) and then Intermediate to Fluent (eleven times). The lowest estimates were in Advanced to Fluent (nine times) and Beginning to Intermediate (nine times). This data supports the original hypothesis that larger differences would be present in the high-to-low combinations (Beginning to Advanced, Beginning to Fluent, and Intermediate to Fluent) and the smaller differences would be the categories next to each other (Beginning to Intermediate, Intermediate to Advanced, and Advanced to Fluent).

The extent the KELPA predicts students' scores on content assessments

The KELPA score was found to have predictive qualities for all the content assessments. In the fourth grade Science assessment, there was a 64% difference in the number of students not meeting the standard. In seventh grade Science, that went up to a 71% difference. In Math, in third grade, there was a 58% difference, in fourth, 60%, in fifth, 64%, in sixth, 72%, in seventh, 69%, in eighth, 60%, in ninth, 22%, in tenth, 53%, and in eleventh, 36%. This shows a substantial difference between the numbers of students not meeting standards based just on their language proficiency level. In Reading, similar results were found. In third grade, there was a 62% difference in the number of students not meeting standards, in fourth, 68%, in fifth, 71%, in sixth, 74%, in seventh, 70%, in eighth, 71%; there were no Beginning students in ninth grade, in tenth, 62%, and 39% in eleventh. Reading shows the highest influence of proficiency on content score.

The effects of proficiency level on content assessment scores across grade levels

Overall, the ELLs who took the content assessments were influenced by the language proficiency category they were in. Those categories were Beginning, Intermediate, Advanced, and Fluent. At all grade levels, $p = <.0001$ and was found to be significant. This means that the null hypothesis has been rejected and the proficiency level does play a role in the all areas content score. The R-Square for these grades was not always the same, so differing amounts of the score are attributed to the fitness of this model. The model fit the best for Reading and overall the worst for Science. In general, the model fit the lower grades better than the higher grades. Ninth grade was an issue for all the content areas due to the low number of participants. Higher grades could have more linguistically demanding tests (Wolf & Leon, 2009), which could explain some of the variance and model fit issues.

The role of demographic variables (such as exceptionality, Free and Reduced Lunch, first language, number of years in U.S., Gender, or total language proficiency category) on content assessment scores

There were six individual variables (exceptionality, Free and Reduced Lunch, first language, number of years in the U.S., Gender, or total language proficiency category) and fifteen two-way pairs (total language proficiency category and exceptionality, first language and years, Gender and exceptionality, total language proficiency category and language, first language and Gender, total language proficiency category and Free and Reduced Lunch, number of years in the U.S. and exceptionality, total language proficiency category and Gender, Free and Reduced Lunch eligibility and Gender, Free and Reduced Lunch eligibility and first language, Free and Reduced Lunch eligibility and number of years in the U.S., Free and Reduced Lunch eligibility and exceptionality, Gender and number of years in the U.S., total language proficiency category and number of years in the U.S., first language and exceptionality) that were analyzed. Some demographic variables were found to have high predictability of students' scores. The best predictor was the students' Total Proficiency Category, which was significant in all but ninth grade Reading. This area was found to be significant 96% of the time. The next best predictors were Exceptionality and Total Proficiency Category, Number of Years in the U.S. and Total Proficiency Category, First Language and Total Proficiency Category, and the Number of Years in the U.S. These areas were found significant between 57% and 32% of the time. The rest of the variables were found to have low significance (below 30%). They were not as good at predicting the content area assessment scores in general. There were some demographic variables that were able to predict well for one content area, such as for Math, eligibility for Free and Reduced Lunch and First Language was significant about half the time (56%), Gender was significant a

little less than half the time (46%), and First Language was significant over half the time (57%); for Science, the Number of Years in the U.S. and First Language were significant a little under half the time (43%) and Number of Years in the U.S. and eligibility for Free and Reduced Lunch was significant over a third of the time (40%); and for Reading, Exceptionality code was significant about half the time (56%) and Number of Years in the U.S. and Exceptionality code was significant over half the time (57%). Interestingly, there were no combinations of demographic variables that were not significant at all. In the following discussion specific demographic variables estimates will be discussed. The estimate reflects the estimated difference that demographic variable has on the score of the test taker and has to be used to provide the amount of score influence that demographic variable represents. All variables except Number of Years in the U.S. and Total Proficiency Category are binomial variables. Total Proficiency Category is ordinal and represents the language proficiency category as determined by the KELPA. The number of years is a number from 0-18 based on the number of years the student has been in the U.S. All estimates for this variable would have to be multiplied by the actual number of years.

It is important to note that of the top five demographic variables and their interactions, Total Proficiency Category was involved four times. It is clear from this that Total Proficiency Category is significant in predicting students' scores on their content assessments. Total Proficiency Category showed that Beginning students did the worst, while Fluent students did the best on their content assessments. The example from seventh grade showed that a Beginning student in Reading would subtract 51 points from what a Fluent student would perform (if all things were kept equal except the language proficiency level). The difference was the most pronounced in Reading; Math and Science seemed to be less influenced by proficiency. Math

and Science, though less influenced, were still significant. In the seventh grade example, in Math, 42 points would be removed from a Beginning student from what a Fluent student performed, and for Science, 39 points would be removed.

Exceptionality and Total Proficiency Category was the next most significant interaction. This interaction was found significant 13 times. Overall for Beginning students the relationship was positive with only two instances of scores going down (seventh grade Science and Tenth grade Reading). It is interesting to note that as proficiency went up those with IEPs tended to do worse. An example from fourth grade is that a Beginning student in Math would add 12 points over what a Fluent student scored, in Reading they would add 17 points, and in Science they would add 10 points. It is interesting to note that if that same example were done with an Advanced student in Math they would add 1 point, in Reading they would subtract 1 point, and in Science they would subtract 2 points. While these are small numbers they still show that those students with IEPs do better at the lower proficiency levels

Number of Years in the U.S. and Total Proficiency Category was the next most significant interaction. This interaction was found significant 10 times. Overall for Beginning students the relationship in Reading is positive. In Math and Science it is much more mixed between positive and negative. This interaction was not significant in any one grade in all three content areas.

First Language and Total Proficiency Category also had 10 interactions that were significant. In all but one grade (eleventh grade Reading) the Beginning students had a positive influence from their language proficiency for speakers of Spanish. There were only 7 instances total that had negative influence (fifth grade Math, Advanced proficiency, seventh grade Math, Intermediate and Advanced proficiencies, eighth grade Math, Advanced proficiency, and

eleventh grade Math, Advanced proficiency; eleventh grade Reading, Beginning and Intermediate proficiency). For an eleventh grade example at the Beginning proficiency level a Spanish speaker would add 9 points to Math, lose 2 points in Reading, and add 6 points in Science compared to a Fluent proficiency student.

The Number of Years in the U.S. variable showed a negative influence on Math scores. In Math it was significant three times, with all three instances being negative. In Reading, it was only significant one time and had a positive influence. In Science, this variable was significant three times, twice it was a negative influence and once was positive. This demographic variable had the most influence on Math and Science scores, and it was a negative one (other than eleventh grade Science).

Based on these results, it is clear that students' performance on content assessments can be influenced by these demographic variables. The pair variables took elements from both the single variables and their pair relationship. Anytime a student's score can be significantly altered by membership in a group, it might be time to look more carefully at what we are testing, how we are testing, and what we are doing with the scores.

Total Language Proficiency Category is clearly a very strong predictor of student performance. This is clear from this analysis as well as the analysis of earlier research questions. This has validity implications for using these tests with the ELL population, especially at the lower proficiency levels.

Validity

Validity theory requires that a test measures what it is supposed to, therefore claims, to measure. This is complicated when the language of the assessments is not part of the construct but has a bearing on the results, such as with the population of students learning English. The

content assessments are administered in English in Kansas unless the language of instruction was not English, in that case, a test can be administered in the language of instruction. The need to ensure that the tests measure what they claim to measure is an issue of equitable results. The results need to be accurate to the individual no matter their group membership (La Celle-Paterson & Rivera, 1994). A potential solution to this issue for the ELL population would be to include a minimum English language proficiency requirement as part of the test construct. This would improve the validity of using these tests with ELLs. This would also have to be addressed in the accountability of test scores as well to improve the validity of test score use.

In 2008, Rabinowitz suggested three questions as part of the Category I studies of validity. "How strong should the relationship be between ELP level and content mastery?" as proficiency goes up, content test scores should also go up. This study found that to be true. Tables 25 through 29 show the relationship for Math, Tables 30 through 34 show the relationship for Reading, and Tables 35 and 36 show the relationship for Science. It is clear from looking at the tables that the higher proficiency levels do better on their content tests. This is grade-dependent, with the lower grades having the clearest connection. This could be, in part, due to the increased content requirements as the standards go up.

The second question Rabinowitz (2008) posed was, "Should the relationship between ELP levels and content mastery differ by content area?" (p. 24), i.e. Reading would be more influenced by language proficiency than Math. Again, this study found this to be true. More students did not meet standards in Reading at the lower proficiency levels than they did Math. Tables 29 and 34 illustrate the percentages of students not meeting standards for Reading and Math. Science is more difficult, since not all the grades took the Science assessment. However, a

comparison of just the fourth and seventh grades would show that Reading was still the most closely linked to language proficiency groups.

The third question Rabinowitz (2008) posed was, "Should the relationship between ELP levels and content mastery differ by language group (or other demographic indicators)?" (p. 24). This study found that several demographic variables were significant in determining placement. Total Language Proficiency Category was the most important, with the interaction of Total Language Proficiency Category and Exceptionality Code next, as can be seen in Tables 39 and 40.

Findings related to previous research

The findings of this study support much of the previous research in the field. It is important to note that a difference between this and a number of other previous studies is that the ELL population was categorized by proficiency level rather than treated as a single subgroup. (Wolf et al., 2008a) This study also considered demographic variables. Pappamihiel and Walser (2009) advocate the inclusion of demographic variables including the number of years in the U.S., English language proficiency, and socioeconomic status (SES) among others. While there is no real direct measure of SES, we can use the eligibility for Free and Reduced Lunch as a tool to view SES. Abedi (2001) indicated the inclusion of demographic variables as well, including Gender, Free and Reduced Lunch eligibility, and the student's disability status, or exceptionality code in this dataset. These demographic variables were included in the study to determine if they accounted for any score discrepancies among students.

The major findings of this study are that language proficiency influences a student's content assessment score. The proportion of students meeting standards and not meeting standards depends on language proficiency; language proficiency can be used to predict student

performance on their content assessments, so can certain demographic variables. Overall, this illustrates a clear picture of the power of language proficiency in student test scores. Baker (2011) found similar results in Georgia, where performance on the language assessment showed positive relationships with Reading, and Math.

The idea that language proficiency influences the content assessment scores of students is not new (Neill, 2005; Giambo, 2010; La Celle-Paterson & Rivera, 1994; Young, 2009; McNamara, 2011; Menken, 2010; Abedi, 2004; Abedi, 2008; Abedi & Gandara, 2006). One necessity in testing is comparability of participants' results. This use of comparability, or comparative validity, is implying that students should perform similarly on their content assessments regardless of their inclusion in a subgroup (Young 2009). If students are of different proficiency levels, then that comparability is diminished (Katz, Low, Stack, & Tsang, 2004; Rabinowitz, 2008). If we are not able to compare ELLs and non-ELL assessment scores (which has been found through the extensive research on the proficiency gap between ELLs and non-ELLs (Abedi, Hofstetter, & Lord, 2004; Abedi, Lord, Boscardin, & Miyoshi, 2001; Butler, Orr, Bousquet Gutierrez, & Hakuta, 2000; McNamara, 2011; Menken, 2010; O'Conner, Abedi, & Tung, 2012)), and we can't compare ELLs to each other–as this research has found,–where does that leave us? Students that are ELLs are likely to underperform compared to their non-ELL peers on standardized tests of content (Abedi, 2001; Giambo, 2010; McNamara, 2011; Menken, 2010; Rabinowitz, 2008). The results from this study conform to this idea by indicating that the groups with higher ELP will perform better on their standardized content assessments. Rabinowitz (2008) also indicates that English language arts should be more difficult for ELLs than Math tests. The data supports this, but not as much as one would expect. Overall, the extent of influence of content areas was uniform. There was increased difficulty in Science and Math as

the grades went up, which corresponds to the increase in content knowledge required to accomplish the tasks.

The proportion of students meeting standards and that of students not meeting standards depends on their language proficiency. This is contrary to Thakkar's (2013) findings, which suggested that the scores were "not significantly related" (p. 114). This could be, in part, due to the design of the tests. If academic English is being accurately taught and tested, then higher language proficiency scores should mean higher content assessment scores. This study found that the higher the language proficiency, the better chance a student has of meeting standards in their content assessments. Abedi and Gandara (2006) found that ELLs performed well below the 50th percentile in Reading and Math, while non-ELLs performed at the 50th percentile. If a student is higher in language proficiency, then their odds of meeting standards also goes up. Fry (2007) found that ELL students were well behind their non-ELL peers in Reading and Math. An interesting finding of this research was that not all interactions of the Total Language Proficiency Category were very significant in the prediction of test scores. Gender and Total Language Proficiency Category, which was significant 17% of the time, and eligibility for Free and Reduced Lunch and Total Language Proficiency Category, which was significant 14% of the time. The results of this section of the research are in some ways the most interesting and unique. Despite searching for similar studies, no other research study with similar implications was found.

Language proficiency can be used to predict the content assessment scores of students. This is reflected well in the first two research questions in this study. If a student's score goes down because of his or her language proficiency, then the possibility to predict scores based on their language proficiency is higher. Rabinowitz (2008) suggests that Math and Reading content

scores have a certain amount of predictability based on language proficiency. This predictability is higher in Reading than Math. Abedi (2001) supports the idea that Reading would be more influenced by language proficiency, because it has a higher demand on the language skills of the test taker. He found that the ELL status of students is connected with their test scores by carrying out multiple regressions. This supports the idea suggested by Menken (2010) and Solano-Flores (2008) that all tests administered to ELLs are, in a way, tests of their language proficiency. In this analysis, multiple linear regressions were conducted for each grade level, content area, and language proficiency group. While the results do indicate an opportunity for prediction, there was extreme variance in the population. This led to inflated Mean Square Errors (MSEs), and inhibited the value of the results. Where predictability was found, Reading had the highest R-square values indicating that the largest portion of the variance was explained with the language proficiency group.

Demographic variables can be used to predict students' content assessment scores as well. Young (2009) discusses the idea of "differential validity" (p. 123), which is testing for validity in different subgroups. In this research, the different groups are based on demographic variables and combinations of demographic variables. Abedi (2001) found that ELL students identified as having disabilities did not perform as well as those who did not have disabilities in tenth and eleventh grade. In this study, interestingly, the single demographic variable that performed the best was Total Proficiency Category, which had a great deal of impact on test scores. The lower the proficiency, the more points would be removed from the score. The number of years in the U.S. had a mostly negative impact on student performance in Math and Science, but positive in Reading which supports the findings of Thakkar (2013). This could be because as the years go up so do the linguistic demands. It could also be due to the content

knowledge difficulty level increasing as the grades increased and built across the grades. This could explain why Reading did not experience the same negative impact. The percentage of the test variation that this variable influenced for Math was no larger than 33%, and as low as 31%. Those identified as having an IEP were the next variable, which included learning disabled, gifted, and all other disabilities and disorders, in Reading (with one instance in Science at the seventh grade). Use of disability as a demographic variable for prediction was also found in Baker (2011); but in Thakkar (2013), no perceptible score differences appeared. Gender was not found to be a major factor in predicating performance, and this would be supported by research about Gender performance in general on state content assessments (CEP, 2010a p. 2). Overall, boys performed better than the girls did in Math, which supports the results of the Baker (2011) study. There were no obvious patterns for when Gender had an impact on student scores except that there were more instances of significance in Math.

Recommendations to Interested Parties

Based on the data analysis in this study, it became clear that ELL students' content assessment scores are influenced by their language proficiency. Legal compliance with the NCLB requires that all students be tested, but maybe how they are tested and how those scores are used needs to be evaluated again. Forcing students to take a test that they know they will do poorly on can increase test anxiety, which can cause students to perform poorly on tests (Backman & Palmer, 1996; McKay, 2000; Yan & Horwitz, 2008; Zeidner, 1998). Test anxiety can have a negative impact on test performance (Rezazadeh & Tavakoli, 2009; Backman & Palmer, 1996); as anxiety goes up, test scores go down. The pertinent question here is whether it is worth testing students that stand an 83% chance of failing. Is there something that can be done to the tests to improve these odds? Is there something to be done about how the tests are used

that can help this situation? The next sections provide recommendations to interested parties, such as the federal department of education, states, schools, and teachers, and suggest some potential answers to the aforementioned questions. Some of the recommendations in the following sections are not directly connected with the analysis done in this study. While not directly connected teachers and test scores are connected in terms of accountability. This allows connections between how the students are performing and teacher preparation for working with this population to be made. Abedi and Herman (2010) indicate that the ELL population is the most likely to have unqualified teachers. If we accept that this is the case, a portion of the problems with improving proficiency might be solved by improving the teacher training.

Recommendations for the federal government. The federal government passed the NCLB legislature originally to ensure that students were given equal opportunities to learn and grow. It has implications far beyond that, especially for a population like ELLs. The federal government needs to be the first to evaluate research in this area and advocate for more research to be conducted. They should want to get the clearest picture of this population and then reevaluate how to test, when to test, and how to use the scores. In the United States, there is a claim that we educate everyone (Equal Educational Opportunities Act of 1974), including ESL students. We need to show that. The section that deals specifically with ELLs is 1703(f) and it might be time to review and add to this section. Right now there is no specific language program requirements but rather the act requests the use of "sound educational theory" (Civil Rights Division Educational Opportunities Discrimination page) which is rather vague. It might be time to be more specific about how this population will be taught, tested, and how the teachers should be prepared. It might also be time to consider a federal standard for all teachers who work with ELLs in school.

The current research shows that it is not valid to include all English proficiency levels in schools assessments and accountability. English proficiency should be a factor in deciding whose test scores count towards accountability for the school. Beginning students performed poorly in all grades and contents, and not including their scores in accountability would be a positive step in policy change. More studies need to be conducted to determine if Intermediate students should be included for accountability or not. More studies need to be conducted looking at ELLs based on their language proficiency, and then comparing them to Native speakers across grade levels to see if there are proficiencies that should not be used for accountability, due to validity concerns. It is clear that there is a link between English proficiency and content assessment performance. This needs to be included in future federal education acts and decisions about this population.

Currently, states can apply for waivers of accountability. Kansas was granted a first round Waiver (CEP, 2012). Waivers modify requirements, and can be renewed if desired. It is important to note that obtaining a waiver does not mean that students are not tested, but it refers to the process that occurs when their test scores are used for accountability. The current waiver is set to expire this year in 2015, and with the advent of the Common Core State Standards, testing may be redesigned (CEP, 2012). As the curriculum is codified, it seems logical that assessments would also be standardized, which could make studies across states easier. Based on the findings in this research, it is clear that a more unified approach to ELL education and assessment is needed to ensure that this population is being treated equitably.

Recommendations for states. The first recommendation for the state of Kansas is to amend 91-1-209(f) (2) in the Regulations and Standards for Kansas Educators (p. 26) and add ESOL. This would require all teachers to complete coursework to receive an ESOL

endorsement. Requiring coursework in methodology and theory for working with ELLs would help prepare teachers who are expected to show that their students have made progress in English language proficiency (Title III). Another recommendation would be to have states collaborate more with the federal government. As we move toward a unified federal education outline, it makes sense to move to a federal system for testing, rather than relying on states to create or purchase their own. Having all tests administered in the same manner and with the same accommodations and timeline would help with consistency, especially for the transient ELL population. It is also important for the states to be aware of the size of the ELL population, and to locate where it is concentrated in the state. As funding decisions can be based off student test scores, it is important not to discriminate against a school that is primarily ELL if they have lower test scores. State educational agencies (SEAs) are required to work with school districts to ensure that the language proficiency of ELLs does not prevent them from participating equally in school programs (U.S. Department of Justice). Section 1703(f) specifically deals with ELLs and with the expectations of the government.

Recommendations for schools. Schools face the challenge of accountability. They have the responsibility to test and report all the students. They also have to manage all the teachers. It is important that teachers have the proper training and credentials, for both their content area and ESL education. Schools should ensure that they hire qualified candidates. This might mean requiring coursework in ESOL rather than accepting a state endorsement alone. For those teachers who are already employed by the school, they should be offered training and development, to ensure they are qualified, both in their content as well as ESL theory and methodology. Téllez and Waxman (2006) indicate that teachers should receive appropriate professional development from their schools. This is not easy, but all students have the right to

quality education. The lack of teachers with the proper qualifications fails to offer quality education to those who need these services. As this population is growing, it cannot be ignored in the hiring and development offerings of schools. This may have the most profound impact in high school. The data from this study suggests that there is a difference between students at the elementary and high school levels regarding meeting standards, with more elementary and middle grade level students meeting standards. Part of this difference might be because the content is harder at the high school level. Part of the difference might be because elementary teachers are better prepared to work with ELLs, having had coursework in sheltered instruction and content-based instruction. This is an area that will require more research to explain.

Recommendations for teachers. Teachers face the difficult job of carrying out the testing required for NCLB. They know the abilities of their students the best, and they know their students' mindsets better than anyone in the school does. The teachers could be allowed more time for testing and test preparations, to help lower the anxiety level of the students. This might mean making individual accommodations for low proficiency students, such as additional time for taking tests or having additional help during the testing window to assist with testing and teaching. Teachers need to be properly trained to work with the ELL population. Title III is designed to ensure that students are improving their English language ability. Teachers are the first contact that students have and they are the ones that help and guide them on their path to acquiring English. In order to claim that ELLs are being given the opportunity for learning, English teachers need to understand best practices and the theory behind them. Currently in Kansas to qualify for an ESOL teaching endorsement, all a candidate has to do is pass the ESOL Praxis test and have a valid teaching license for the state (J. Ewing, personal communication, October 8, 2015). Having the proper training in their content area positively correlates with

students' test scores (Hayes et al., 2002). Teachers who go through ESOL teacher education programs understand the content-based instruction and sheltered instruction methodologies, which prepare students to be better aligned with the content tested through development of academic language and content knowledge. Teachers who work with this population should take classes and receive proper training in ELLs as well as their content area licensure. This should also not be limited to content area teachers. All teachers need training in ESL methods and theory, if they are going to work with ELLs. In addition, if ELLs are being pulled out and taught in ESL classrooms, then those teachers need to have credentials in the content that they teach. Having qualified teachers working with this population could improve students' scores and preparations. The research in this study shows that low proficiency students performed poorly on their content assessments fairly uniformly. The teachers that work with these students should advocate for alternative testing of low English proficiency students as well as how the scores from this population are used. They should be part of the solution by working on alternative testing methods that will reflect a student's content knowledge rather than as a reflection of their English language ability.

Limitations of the study and future research

This study had a number of limitations. As a quantitative study, the first limitation is that this study can only tell part of the story. It can tell a limited version of what happened. It cannot answer the bigger questions of why it happened. Students' performance on the KELPA and the content assessments are just a couple of instances of their learning at one set point in time, and may not necessarily reflect their knowledge of English or their actual academic knowledge. This research only provides this one view of the situation. A future approach would be to include a longitudinal study, and include other test data (both from other norm referenced tests, as well as

student classroom assessments and formative assessments). Another limitation is that the data represents only one state, in this case, Kansas. The data from one state may not be wholly generalizable to any other state or area. This dataset also only represents one years' worth of data (2009–2010) and may have anomalies that would not exist in other years, or with multiple years making up the dataset. The positive aspect to using data from 2010 is that all students were required to take the test; there were no options to choose against participating offered to students. A potential solution to these issues for future research would be to include multiple states in the analyses, and to move to a longitudinal analysis.

Another limitation was the amount of variance in the data itself. Young, Holtzman, and Stinberg (2011) found that, "ELLs had the largest score variability" (p.9), therefore, a portion of the score variance might come from the ELLs themselves. Since this is a very large dataset, there was a great deal of variance. This could be because of the language ability, but it could also be from any number of non-analyzed variables not limited to the students' interest, such as how they were feeling on the test day, how the test was administered, what time of day, to name a few. This is controlled for in reliability testing, Peyton conducted reliability measures on the test in 2009, and found that the coefficients ranged from 0.61 for the Listening domain to 0.92 for the Speaking domain across all forms (Peyton et al., 2009). The variance could not be controlled for in the regression, which created difficulties with the analysis and interpretation of results. More time needs to be spent to study if there was an additional variable that could help control for some of the variance, such as district, school, testing dates, and duration of time in school, time spent with the same teacher or any other variables that might have decreased the variance. The recommendation for the future would be to test variables, and see if they help with the variance. The most logical place to start would be with district information (which was not included in the

dataset received for this study). This poses its own challenge, as that information is often difficult to obtain from a state agency, as it could potentially identify the participants. A variety of variables should be tried to attempt to diminish the variance in the dataset. If this is not possible, then an attempt to explain why there is so much variance would be a possible direction.

Another suggestion for future research involves the inclusion of native speaking students content test scores. In order to determine the proficiency levels of ELLs that are valid to assess, it is important to compare the proportions of students that are meeting standards and those that are not to the same grades native speaking students. From this analysis it is clear that the Beginning level is not being assessed validly, but the other proficiency levels are more difficult to address with just one years' worth of data from only ELLs. It would be best to get a few years' worth of data from ELLs and native speaking students across the grade levels. Do the analysis in this study of all the data (looking at the proportion of native speaking students that meet standards and don't meet standards) and then using the proportions from the native speaking group, find the proficiency levels of ELLs that are performing similarly. Any group that is performing similarly or better than the native speaking students would be tested and used for accountability.

The final major limitation to this study is a limitation to validity theory itself, since English knowledge can affect content assessment scores, it is possible that the scores reported for the content assessments will not reflect the current knowledge of the students (Abedi, 2008; Cook, 2011; Winter, 2011). This study attempted to look at the relationship between content assessments and the language proficiency assessment, but assessments do not always accurately indicate the knowledge of the participants. According to La Celle-Paterson and Rivera (1994), some ELLs have the content knowledge, but are unable to convey this knowledge through their

limited English speaking or writing skills. The findings of this study also show that English language proficiency is a major factor in content test performance. That is not to say that low English proficiency means low Math content knowledge, but low English proficiency makes it difficult or even impossible to show Math content knowledge in testing. Various factors are responsible for the development of language proficiency and content knowledge in ELLs (Lindholm-Leary & Borsato, 2006). It would be very difficult to include all the factors in any testing situation, as it would be difficult to include all aspects of the test usefulness model (Bachman & Palmer, 1996). The goal is to include as many factors in the testing situation as possible and clearly English language proficiency needs to be a factor.

Final Thoughts

The research presented in this paper shows that English language proficiency had a significant influence on content assessment scores for the 2009-2010 school year in the state of Kansas. As the grade level went up, the percent of students not meeting standards also went up. Students who were considered Fluent performed the best on all content assessments. Students who were considered Beginning performed the poorest on all content assessments. Like in previous research, Reading was the most influenced skill, but Math and Science were also impacted. This research shows a clear relationship between English language proficiency and content assessment scores for all three content areas examined (Reading, Math, and Science). When constructing future tests, it would be worth thinking about how we could lower the amount of linguistic demand in content assessments that should be separate from English language ability, such as Math and Science. In addition to how tests are constructed, how they are administered and interpreted must be taken into consideration. All tests that assess ELLs need to have English language ability as a part of the construct, clearly indicating the relationship with

the content measure. All teachers that work with ELLs should receive training in how to work with this population, and the state of Kansas should consider changing its practice of accepting the Praxis test results as the only requisite for obtaining a valid ESOL endorsement. The only way to accurately measure what these students know is to find a way to look beyond their English knowledge. It is the responsibility for everyone involved in the measurement of this group to make sure they are treated fairly.

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