# THE RELATIONSHIP BETWEEN ARABIC LANGUAGE PROFICIENCY, ENGLISH LANGUAGE PROFICIENCY, AND SCIENCE ACADEMIC ACHIEVEMENT OF 11TH GRADE ARABIC SPEAKING ENGLISH LANGUAGE LEARNERS

by

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## DEDICATION

I dedicate this dissertation to God who has given me another chance to live and pursue my dreams. My husband, Mahmud, through his love, support and encouragement gave me the strength to continue working on this project. Our precious children, Hassan and Laila, who inspire me to work harder to be the best role model I can be. My mother, Leila, for which words cannot describe the outpouring of love, support and guidance that she has given me all my life. She kept pushing me to pursue higher academic levels and being there to help me through the tough moments where I thought I just couldn't continue. My husband and I are forever grateful to my mother for being there to help us take care of our children during the writing of this dissertation.

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## TABLE OF CONTENTS

## LIST OF TABLES

## LIST OF FIGURES

## Chapter 1: Introduction

English Language Learners (ELL) are a group of minority students that come from all parts of the world to the United States for a chance to learn English as well as gain opportunities for a better life and a chance to achieve the "American Dream". Arabs make up one of the minority groups that come to the United States from the Middle East. According to Cruz and Brittingham (2003), almost half of the Arab population is living in five states: Michigan, Florida, California, New Jersey, and New York. Michigan has the largest number of Lebanese (a form of Arabic dialect) speaking students (Cruz & Brittingham, 2003). The Federation for American Immigration Reform (FAIR) cited that other than English, Arabic was the second most spoken language at home in the state of Michigan (FAIR, 2000).

Research confirms that learners of English are admitted into American schools with a number of linguistic and academic limitations (Minicucci & Olsen, 1993). However, the problem here is not just a language issue. Many children come from war-torn countries such as Iraq forcing them to live in refugee camps, and sadly interrupting their schooling. This disruption of education prevents ELL students from attaining full language proficiency in their native language, which makes it difficult for them to acquire English as a second or third language (Chamot, 1993; Freeman & Freeman, 2000). The research done on English language learners focuses mainly on how to improve their English language skills and according to August and Hakuta (1997) little attention is given to core academic subjects especially science. Educators and scientists have expressed that English language learners should be more involved in science-related fields. However, the science communities have expected the English language learners to assimilate into the institutional culture because they were unsure as to how to integrate English language learners' norms and practices into the mainstream culture and curriculum (Eisenhar,

finkel, & Marion, 1996; Rodriguez, 1997). For many years, the focus of teacher training or professional development has been offered to educators who teach English as a Second Language (ESL) and not as much attention was directed to subject area teachers so that they can have the tools necessary to enhance student learning and achievement (Lee, 2002; Warren, Conant & Rosebery, 1992).

Therefore, the schooling and enhancement of learning for English language learners becomes a challenge for educators and policy makers. This study attempts to focus on Arabic-speaking English language learners and shed light on two important issues 1) the importance of the learner's first language proficiency (Arabic) on second language proficiency (English) and 2) the importance of first language proficiency (Arabic) on science academic achievement in English. This chapter is divided into two sections. The first section discusses the background of the proposed study, which includes information about the migration of Arabs to USA, the formal Arabic language used in the Arab world, and Metropolitan Schools (pseudonym) that has large numbers of ELL students. The second section discusses the proposed study.

**Background**

Since the English language learners who participated in this study were Arabic-speaking students, an introduction on the migration of Arabs to USA is discussed. Furthermore, because the native language that was assessed in this study is Arabic, a brief description of Modern Standard Arabic will be provided which is the formal Arabic that is used in the Middle East. Finally, an in-depth look at the school system where Arabic-speaking students are enrolled in will be discussed. Metropolitan schools (pseudonym) have large numbers of ELL students that come from many countries in the Middle East including war-torn countries such as Iraq. This challenges the Metropolitan school system due to the fact that many of these immigrants are not

fluent in their mother tongue language, which provides a barrier when it involves learning English as a second language and gets even tougher when trying to teach subject area courses such as science. Following the background information about migration of Arabs to USA, Modern Standard Arabic, and Metropolitan Schools is a discussion about the role of first language proficiency on second language acquisition and the role of first language proficiency on science achievement.

**Migration of Arabs to USA**. According to Ameri and Ramey (2000), Arabs started traveling to the States early since the 15th century. The "Great Migration" was a period from 1880-1924 and represented the time frame where the greatest numbers of Arabs were admitted to the US (Ameri & Ramey, 2000). These Arab immigrants are from Syria, Jordan, Lebanon, Palestine/Israel, Yemen, Morocco, Iraq, and Egypt (Ameri & Ramey, 2000). Many of these recent immigrants have settled in states such as Michigan, New York, California, New Jersey, and Texas (Abraham & Abraham, 1983). According to Hassoun (2005), the first Arab immigrants to come to Michigan were Lebanese villagers and migrated from 1930-1938. Soon after, many Arab immigrants from all over the Middle East followed and settled into certain areas in the Metropolitan area. For example, the Lebanese people settled in East Dearborn, and the Yemeni population migrated to the South end of Dearborn (Hassoun, 2005). This study focused on the Arabs living in Michigan specifically the Greater Detroit area.

According to this investigator, the largest numbers of recent Arab immigrant students in the State of Michigan come to Metropolitan Schools (pseudonym). There has been a specific increase of Iraqi refugees in metropolitan schools (M. Sedgeman, personal communication, January 22, 2007). Due to the war, these students were forced to leave their homes and live in camps in Saudi Arabia with limited education provided to them (Isa, 2003). According to

Clements (2007) in an article for World Vision, she stated that many Iraqi students come with gaps in their first language. Clements further discusses that many Iraqi refugees flee to Jordan to seek asylum, but they are not given legal status in that country. Therefore, formal education cannot be given to those with no legal status and many Iraqi families cannot afford to send their children to private schools (Clements, 2007).

**Modern Standard Arabic.** According to Mahmoud (2000), Modern Standard Arabic (MSA) is the main or formal Arabic that is used in the Arab world. Furthermore, he states that informal Arabic or slang Arabic is called non-standard Arabic (NSA). Educated people who have been taught Arabic formally at school speak MSA. However, NSA is acquired by daily exposure to the Arabic language and is the conversational language that is spoken and does not reflect formal schooling in Arabic (Mahmoud, 2000). This distinction between MSA and NSA is an extension of the work that was originally done by Ferguson in 1959 (as cited by Palmer, 2008) where he describes the Arabic language as being diglossic in nature. This means that the Arabic language has two registers or dialects, which Ferguson labels as high and low. The high register refers to the MSA and NSA is considered the low register. As earlier stated, due to the fact that many immigrant students had interrupted schooling in their first language, it is expected that many students may speak the non-standard Arabic (NSA), however, may show a weakness in modern standard Arabic (MSA).

**Metropolitan Schools**. Metropolitan Schools is a large school district that has a student population of 15,934 (K-12). Metropolitan schools contain 5,007 Limited English Proficient (LEP) students, which make up about 32% of the student population (Tabrizi, 2008).

According to Tabrizi (2008), Metropolitan Schools have the highest LEP student population in Michigan. Due to a large immigrant influx in the last few years, Metropolitan

Schools' LEP population has had a substantial increase. Almost every classroom has ELL students and in nine schools, over half of the student population is Limited English Proficient.

It is surprising that with the high number of LEP students, Metropolitan schools have not moved towards a dual language program that supports the native language of the learner while teaching English language. Limited educational research (Saad, 1990; Dakroub, 2002; Al-Fadley, 2009) has been done to include language minority learners such as Arab students attending Metropolitan schools. In an effort to promote dual language education, the superintendent of Metropolitan schools submitted and was approved a grant by the federal government in the 1990's, but later the school board declined this idea and disregarded the intense research and success of such programs (M. Sedgeman, personal communication, January 22, 2007).

This investigator will next discuss the independent variable in her study namely first language proficiency and how it relates to second language proficiency and science academic achievement in English, which are the two dependent variables in this study. It was important to include the relationship that first language (L1) has as on second language (L2). Due to the vast amount of research done in this area and because a high score in L2 could also impact science academic achievement in English.

**The relationship between first language proficiency (L1) and second language proficiency (L2)**. Most of the bilingual programs were designed to promote mono-lingualism because it was thought that the minority language would hinder the acquisition of a second language (William & Snipper, 1990). Therefore, most of the bilingual programs are known as "transitional" programs and the idea here is that once English language learners reach a specific level of English language proficiency then the students are transitioned into mainstream English

classes. Transitional bilingual programs place students into one of three levels (beginning, intermediate, and advanced) ESL classes where instruction is mainly in English with some use of native language only if the teacher speaks the language of the minority student. These programs do not focus on native language development but serve as a way to help students achieve English language proficiency by slowly discontinuing native language instruction. This is also known as a "quick-exit" compensatory model, which is strongly opposed by researchers (Thomas & Collier, 1997; Saville-Troike 1984) who believe that rather than being replaced, the native language should be encouraged so that it provides the basic skills needed for the ELL student to transfer that knowledge to learning a second language and be successful with conceptually demanding tasks of the mainstream classroom (Crawford, 1999).

The theoretical framework supporting the idea of L1 knowledge transferring to L2 comes from the Linguistic Interdependence Hypothesis originated by Cummins (1979) that describes the transfer of L1 to L2 will only occur if a certain level of proficiency in L1 is attained. There are many empirical studies (Wagner, Spratt, & Ezzaki, 1989; Saad 1990; Dakroub, 2002; Gelderen, Schoonen, Stoel, Glopper, & Hulstijn, 2007; Carrell, 1991; Bernhardt & Kamil 1995; Ordonez, Carlo, Snow, Mclaughlin, 2002; Proctor, August, Carlo, Snow, 2006; Carlisle & Beeman, 2001; Meschyan & Hernandez, 2002) that support Cummins's Interdependence Hypothesis.

Cummins later proposed the Common Underlying Proficiency (CUP) and the Iceberg Model (1984) to further explain the Linguistic Interdependence Hypothesis. According to Cummins, the Iceberg Model states that L1 and L2 operate through a central processing system in the brain. Therefore, it doesn't matter, which language the student is using, the processing that happens behind the language production comes from their underlying cognitive ability. Reading,

writing, speaking, and listening in the first language, therefore, can help students develop the same skills in the second language.

Native language assessment has also been known to identify "special-needs" students and place them in bilingual special education programs. Failure to test for native language proficiency allows for mistakes to happen when identifying the needs of the students. For example, an LEP student may be thought of as a learning disabled or a "special-needs" student because his/her reading rate is very slow. If native language was assessed in this situation, then educators would see that the student's reading level is normal in their native language, which means they are just low level English learners and not special education students (Sparks, 1995). The theoretical reasoning behind the bilingual/special education distinction came from Linguistic Coding Differences Hypothesis (LCDH) suggested by Sparks and Ganshow (1993) which explains that L1 and L2 have similar learning mechanisms and that a weakness in a certain skill in L1 will be later observed in L2. There are many studies (Sparks, Ganshow & Patton, 1995, 2008; Sparks, Ganschow, Artzer & Patton, 1997; Sparks, Ganschow, Patton, & Humback, 2009) that have been done to support LCDH.

Krashen (1982) states that literacy development in L2 is positively influenced by literacy development in L1 and has proposed two hypotheses (Acquisition-Learning and Natural Order) to explain the process involved when learning a second language. Both of Krashen's hypotheses are related. For example, when students are exposed to L2, Krashen states that students "acquire" the second language without having to go through a specific learning process. The reason why students "acquire" and not learn is because language acquisition follows a natural process, which the Natural Order hypothesis claims. Therefore, if students followed the natural order process of learning to grasp their first language than according to Krashen (1982), the student will

eventually "acquire" the second language if there is enough exposure in L2.

Cummins, Krashen, Sparks and Ganschow's research is valuable to educators because it allows them to be equipped with knowledge of second language acquisition and to know the factors that speed up the process, such as proficiency in L1. This means that in order for students to learn a second language such as English, it's best to make sure that their primary language is continuing to develop as well so that their knowledge can be easily transferred to L2. In the next section, the investigator will examine the relationship of first language proficiency on science academic achievement in English.

**The relationship between first language proficiency and science academic achievement in English.** Most bilingual programs as stated above, do not consider maintenance and development of ELL's oral and written proficiencies in the home language as relevant to academic achievement. There needs to be a reform movement aimed at academic achievement of ELLs with the knowledge of English language and literacy development and the knowledge of using primary language to enhance the learning of science. This reasoning has been supported by Cummins's Threshold Hypothesis (1981), which explains that a specific level of academic proficiency in the first language must occur before a cognitive transfer from L1 to L2 can be observed. Cummins later developed the BICS (Basic Interpersonal Communication Skills)/CALP (Cognitive Academic Language Proficiency) Theory (1984) to distinguish between the low threshold of BICS and the higher threshold of CALP.

The following empirical studies (Lynch, Chipman, & Pachaury, 1985a; Lynch 1996a, 1996b; Thomas & Virginia Collier, 1997; Kearsey & Turner 1999; Tobin & McRobbie 1996; Calderon, 2003) studied the effects of bilingualism on science achievement in English. Saad (1990) and Dakroub (2002) examined the impact that L1 (Arabic) has on mathematics. Calderon

(2003) studied the relationship between academic language proficiency in Spanish and English and the academic achievement in science of 9th grade English language learners in western Michigan. There is little or no research done to focus on Arabic language proficiency and science achievement in English. This study investigated the relationship between Arabic language proficiency (L1) and science academic achievement in English (L2) of 11th grade Arabic speaking students in Southeastern Michigan.

**The Proposed Study**

This section includes: (1) problem statement; (2) significance and need for the proposed study; (3) purpose of the study; (4) research questions; (5) research hypotheses; (6) null hypotheses; (7) definitions of terms; and (8) assumptions of the study.

**Problem statement**. Arabic high school students who have recently immigrated to the United States are entering the public education system. These students often are placed in ESL classes to help them make the transition from their Arabic native language to English. During this period, they are taught using a transitional bilingual education approach. These students complete the English Language Proficiency Assessment (ELPA) from the Michigan Department of Education (MDE, 2009) and are placed in the appropriate English classes based on their scores. When they score proficient on the ELPA, they are mainstreamed into regular education classes. However, many of these students are having difficulty in their core English education classes (language arts, mathematics, and science). Research has shown that first language proficiency has an important influence on second language acquisition and performance in school (Cummins, 1989; Krashen, 1981).

**Purpose of the study**. The purpose of this study is to describe if a relationship exists between first language proficiency and school performance, especially in English science

classes. The study also investigated the relationship between first language proficiency and second language proficiency to decide if ESL students who are proficient in their primary language are becoming proficient in English. Specifically, the study used an Arabic Test called Versant Arabic Test (VAT) that is designed by Pearson researchers (2008) to assess sentence mastery, vocabulary, fluency and pronunciation in the Arabic language. The English Language Proficiency Assessment (ELPA) was used to assess reading, writing, listening and speaking in English. Science academic achievement was analyzed using the Michigan Merit Examination (MME) science scores from the Michigan Department of Education (MDE, 2008-2009).

**Significance and need for the proposed study**. The need for this study stems from three main reasons and concerns. First, Metropolitan schools have the largest number of Arabic-speaking students outside of the Middle East and limited or no research has been done to investigate the relationship between Arabic language proficiency and its relationship on English language proficiency and science academic achievement in English. Second, the few studies that were done in Metropolitan schools, studied the relationship that L1 has on academic achievement in mathematics and none were done to show the relationship on science. The studies done on the relationship between L1 and mathematics in the Metropolitan school system include Saad (1990), Dakroub (2002) and AL-Fadely (2009). On the other hand, there have been studies outside the Metropolitan area that have used Spanish-speaking students and science academic achievement in English (Calderon, 2003; Tobin & McRobbie, 1996). Third, this study re-emphasizes the importance of having dual language programs that will allow English language learners to improve English skills as well as maintain their native language.

The molar independent variable in this study is Arabic language proficiency. Its sub-molecular variables include: Versant sentence mastery, Versant vocabulary, Versant fluency, and

Versant pronunciation). The molar dependent variables are English language proficiency and science academic achievement and their sub-molecular variables include: ELPA Reading, ELPA writing, ELPA listening, ELPA speaking, ELPA comprehension, and MME science. The table below provides the specific, sub-molecular independent and dependent variables and the assessment tools used to measure them. The molecular variables within each assessment are also identified.

Table 1

*Type of Assessments and Variables used in this Study*

| Assessment and Independent Variables | Assessments and Dependent Variables |
|---|---|
| Arabic Language Proficiency (molar variable) | English Language Proficiency/Science Achievement (molar variable) |
| 1. The Versant Arabic Test (VAT) assess the following 4 specific, sub-molecular variables;<br>• Sentence mastery<br>• Vocabulary<br>• Fluency<br>• Pronunciation | 1. English Language Proficiency Assessment (ELPA) assess specific, sub-molecular variables;<br>• Reading<br>• Writing<br>• Listening<br>• Speaking<br>• Comprehension<br>2. Science Academic Achievement in English assess specific sub-molecular variable;<br>• Science MME |

**Research questions.** The following research questions were addressed in this study:

1. Is there a relationship between a) Arabic language proficiency as measured by the Versant Arabic Test (VAT) and b) English language proficiency as measured by the English Language Proficiency Assessment (ELPA) of 11th grade Arabic speaking English language learners?
2. Is there a relationship between a) Arabic language proficiency as measured by the VAT and b) science academic achievement in English as measured by science grade point average, and by the Michigan Education Assessment Program (MEAP) of 11th grade Arabic speaking English language learners?

**Research hypotheses.** The following hypotheses were addressed in this study:

1. There is a relationship between a) Arabic language proficiency as measured by the Versant Arabic Test (VAT) and b) English language proficiency as measured by the English Language Proficiency Assessment (ELPA) of 11th grade Arabic speaking English language learners?
2. There is a relationship between a) Arabic language proficiency as measured by the VAT and b) science academic achievement in English as measured by science grade point average, and by the Michigan Education Assessment Program (MEAP) of 11th grade Arabic speaking English language learners?

**Null hypotheses.** The following specific null hypotheses to be examined are:

1. There is no statistically significant difference between a) Arabic language proficiency as measured by the Versant Arabic Test (VAT) and b) English language proficiency as measured by the English Language Proficiency Assessment (ELPA) of 11th grade Arabic speaking English language learners?

2. There is no statistically significant difference between a) Arabic language proficiency as measured by the VAT and b) science academic achievement in English as measured by the Michigan Merit Examination (MME) of 11th grade Arabic speaking English language learners?

**Definitions of terms.** The following are words and definitions that will be used in this study.

***Arabic language proficiency***. Students showing fluency and competency in Arabic.

***Arabic Diglossia***. The high (MSA) and low (NSA) registers of the Arabic language (Palmer, 2008).

***English language proficiency***. Students showing fluency and competency in all four-language skills: speaking, reading, writing and speaking in English.

***English Language Proficiency Assessment (ELPA).*** An assessment that evaluates students' speaking, reading, writing and listening abilities. The five sections of the ELPA include multiple-choice, constructed response, short response, and extended-response items. ELPA scores are then divided into four proficiency levels: (a) basic, (b) low intermediate, (c) high intermediate and (d) proficient (MDE, 2009).

***Mainstream Classroom.*** A setting in which subject matter is taught using English as the means of instruction.

***Science academic achievement***. Students' achievement in science as measured by the Michigan Merit Examination (MME; MDE, 2008-2009).

***Versant Arabic Test***. An Arabic test created by Pearson researchers and educators and it measures Arabic proficiency in Modern Standard Arabic by assessing skills in sentence mastery, vocabulary, fluency and pronunciation (Pearson, 2008).

**Assumptions of this study**. This study assumed that English language learners who were proficient in their native language had formal schooling and exposed to academic courses in their homeland. Another assumption this study made is that bilingual instruction programs are programs that instruct students in both of their languages i.e. L1 and L2.

## Chapter 2: The Review of Literature

This chapter consists of two sections. The first section will discuss the theoretical framework of the three variables: first language proficiency (L1), second language acquisition (L2) and science academic achievement in English. The second section will include empirical research discussing these variables.

### Theoretical framework

The section below will discuss the theoretical perspectives made by Cummins (1979, 1984), Sparks and Ganshow (1993), and Krashen (1981), which relate to the hypotheses in this study.

**Cummins's perspective.** Cummins (1979, 1981, 1984) supports the transfer of L1 to L2 and refers to it as the "Linguistic Interdependence Hypothesis". He defines it as the extent to which the first language is successful in allowing full language proficiency in the same language. Furthermore, Cummins explains that the transfer of L1 proficiency to L2 will take place if there is enough exposure to the second language. This investigator uses Cummins's Linguistic interdependence hypothesis to support the transfer of skills from L1 (Arabic) to L2 (English). Therefore, students will only be able to transfer language skills from Arabic to English only when they have attained full language proficiency in Arabic. Only then, will students be able to acquire English and show a positive correlation between L1 and L2.

Cummins (2000) presents the Common Underlying Proficiency (CUP) also known as the Iceberg Model to elaborate further on the Linguistic Interdependence Hypothesis. The Iceberg Model illustrates that L1 and L2 have different surface characteristics but they both operate through a central processing system in the brain. Cummins (2000) CUP model can allow this investigator to apply this principle to the Arabic speaking participants in the study. Therefore, in

the case of this study, English and Arabic may appear different at the surface. However, the thinking process is the same for both languages. Moreover, students who are competent in Arabic will be able to transfer those same skills to acquire English as a second language. This investigator used Cummins's Linguistic Interdependence Theory and CUP as the basis for testing student's first language (Arabic) and examined the relationship that it has on second language acquisition (English).

Cummins (1981) proposed the Threshold Hypothesis, which clearly states that in order for students to see a positive effect of L1 on L2 in terms of academic and cognitive growth, they must achieve a high level of competence or "threshold" in their native language. Cummins (2000) claimed that the best way to make sure that Limited English Proficient (LEP) students are succeeding cognitively and academically is to enhance their primary language proficiency and to make sure it reaches a high cognitive level. Cummins's Threshold Hypothesis (1981) has relevance to this research because this investigator measured the proficiency level of students' native language and if they have attained a sufficient level of competency in L1 then according to Cummins, the skills in L1 can be transferred to L2, which will show improved English language scores as well as higher science academic achievement in English. In other words, students who attain a high cognitive level in Arabic should be able to transfer that knowledge and attain a high cognitive proficiency in English, which will help students understand scientific concepts in English.

Cummins's (1984) established the terms Basic Interpersonal Communication Skills (BICS) and Cognitive Academic Language Proficiency (CALP) to provide a more in depth explanation to the different levels of the Threshold Hypothesis. According to Cummins (2000), BICS are language skills needed in social situations. English language learners (ELL) use the

day-to-day basic interpersonal skills when they are on the playground or at recess. These skills are not very demanding and are easy for newcomers to learn and use immediately. These language skills are acquired within six months to two years after arrival in the U.S. Furthermore, Cummins (2000) describes CALP as referring to the language that is necessary for formal academic learning where the student is required to show understanding of the subject area studies such as science or mathematics. Cummins claims that these students need time in order to become proficient in using academic English because it requires time to build academic vocabulary. However, he points out that if students were schooled in their first language and acquired a high level of literacy in L1 then this will transfer to their academic literacy in L2, which will lessen the amount of time the students need to become proficient in academic areas. This usually takes from five to seven years.

Using Cummins's BICS and CALP theory will allow this investigator to categorize different levels of Arabic proficiency. For example, students who appear to only have simple communication skills in Arabic will be the BICS group, which according to Cummins (2000), these students present only "surface level" proficiency and not cognitive or academic proficiency, which requires longer time to achieve. Therefore, BICS students will not show progress in science comprehension. On the other hand, students who have attained cognitive language proficiency in Arabic are the CALP group. These students should show a higher level of scientific reasoning and understanding than the BICS group. This information is pertinent to this study to explain the idea that if a student appears to have good oral skills in English or Arabic that doesn't necessarily mean he/she has good written and reading skills in the same language.

**Sparks and Ganschow's perspective**. The Linguistic Coding Differences Hypothesis (LCDH) proposed by Sparks and Granshow (1993) suggests that L1 and L2 have similar basic learning mechanisms. Therefore, students who have difficulties with rule systems in L1 are likely to find similar problems when acquiring L2. Sparks and Granshow (1993) based their hypothesis on early observations of college students that had difficulties with second language learning. As educators in the field of special education, they were observing learning disabilities among students and found that second language learners were facing the same challenges. Their results revealed students who had weak competency in L2 appeared to have similar specific difficulties in L1. Therefore, Ganschow and colleagues made an attempt to focus on the relationships of L1 and L2 specific difficulties. They have conducted extensive research to support their Linguistic Coding Differences Hypothesis (Sparks et al., 1995; Sparks et al., 1997).

Sparks and Ganshow's hypothesis provides the theoretical underpinnings for this study because it provides an understanding for the language obstacles faced by English language learners. Thus, weaknesses in L1 will automatically show weakness in L2. The value of Sparks and Ganshow's contribution in this study is pertinent because weaknesses in Arabic will be observed in English. This will allow the investigator to filter out all learning disabled students who may show signs of a learning disability in their native language and thus these students will not be included in this study.

**Krashen's perspective**. Krashen (1981) proposed the Acquisition-Learning Hypothesis to explain the transfer of L1 to L2. He refers to the term "acquisition" to infer the subconscious process where the ELL student is unaware of the similarities and differences regarding L1 and L2. In addition, Krashen describes the conscious method of acquiring a second language as "learning" where the ELL student is aware of the rules and properties of the target language.

Thus, according to Krashen (2003), having the skills in the Arabic language can accelerate English language acquisition because the ELL learner already has background knowledge in L1 allowing for the second language input to be more comprehensible. Furthermore, Krashen (1996) specifically pointed out that reading is the same across all cultures. For example, Arabic students who may have mastered literacy skills in Arabic are likely to transfer those skills to acquire another language such as English. This concept comes from The Natural Order Hypothesis where Krashen (1982) introduces the idea that there is a natural process where grammar knowledge is learned and applies to the acquisition of first and second languages.

The above theoretical perspectives offered to us by Cummins, Ganschow, Krashen, and Sparks, support the concept of language transfer from L1 to L2 and they were chosen due to their relevance in this study. In the next section, the investigator will provide the empirical research on L1 and its relationship to L2 as well as L1 and how its relationship to science academic achievement in English.

**Empirical Framework**

This section will provide a review of the empirical research that supports the hypotheses presented by Cummins, Krashen, Sparks and Ganshow. The studies will be divided into two sub-sections, which include the empirical perspective of 1) L1 and its relationship to L2 and 2) L1 and its relationship to science academic achievement in English. Additionally, a critique of the studies will follow each sub-section.

**Empirical perspective of L1 and its relationship to L2**. There are many empirical studies that have underpinnings of the above theorists that have focused on specific language skills in L1 that directly affect other language skills in L2. Therefore, in this section the

investigator will first examine studies in reading in L1 with reading in L2 (Wagner, Spratt, & Ezzaki, 1989; Saad, 1990; Dakroub, 2002; Gelderen et al, 2007; Sparks et al, 2008; Carrell, 1991; Bernhardt & Kamil, 1995). Second, the investigator will examine a study of vocabulary knowledge in L1 with speaking and reading in L2 (Ordonez et al, 2002). Finally, studies that focus on vocabulary knowledge in L1 later improving reading scores (Proctor, August, Carlo, Snow, 2006; Carlisle & Beeman, 2001; Meschyan & Hernandez, 2002) will be discussed. Once these studies are summarized then at the end of the section they are critiqued.

***Summary of studies.*** Wagner, Spratt, and Ezzaki's (1989) study was set to examine if L1 is necessary for the transfer of L2. They studied two groups of students that consisted of native speaking Berber students and native speaking Arabic students. These two groups were studying Arabic and French. Although, the purpose of their study was to show that L1 is not always needed for the transfer to L2. They still came across two important findings that support L1 to L2 transfer. First, they found that that in later grades, the reading skills of Berber speaking and Arabic speaking students became similar, which indicated that Berber speaking students had a good grasp of their first language (Berber) thus allowing the transfer to Arabic to be successful. Second, Wagner, Spratt, and Ezzaki (1989) also found that the reading achievement in L1 (Arabic) was related to reading achievement in L2 (French). Saad (1990) and Dakroub (2002) also focused on Arabic-speaking students. Saad (1990) focused on elementary school students and observed that students who were literate in Arabic achieved higher in English and math. The students were given an Arabic test in order to be placed in levels of high or low Arabic literacy. Furthermore, scores from the Iowa Test of Basic Skills (ITBS) were used to determine the achievement in mathematics and English. Therefore, those students who had a higher level of Arabic literacy also had better scores in mathematics. Dakroub (2002) focused on middle school

students and examined the relationship between first language literacy and its effect on English reading, language and mathematics. He used an Arabic assessment to place students into two groups. Also, scores from the Terra Nova test were used to measure achievement in reading, language and mathematics. Saad (1990) and Dakroub (2002) claimed that students who have high Arabic language literacy outperformed those students with low Arabic literacy in the area of English language reading.

Sparks et al. (2008) studied the relationship between reading comprehension in L1 (English) and L2 (German, French, or Spanish). These students had studied two years in German, French or Spanish. The results revealed that the L1 (English) reading comprehension skills that were developed in early grades provided significant evidence for the transfer of those skills to L2 (German, French, or Spanish) reading comprehension.

A study conducted by Gelderen et al. (2007) set out to investigate the relationship between reading comprehension in L1 (Dutch) and L2 (English). Their study was well grounded because it had theoretical underpinnings of both the transfer hypothesis and the threshold hypothesis, which are similar to this study. They used the transfer hypothesis to predict a strong relationship between first and second language reading comprehension. Moreover, the threshold hypothesis was used to predict that vocabulary and grammar knowledge will have a positive effect on both L1 and L2 reading comprehension. Gelderen et al. found that vocabulary knowledge in both L1 (Dutch) and L2 (English) not only contributed to better reading comprehension in both languages, but it enhanced their metacognitive knowledge, which validated both the transfer and threshold hypotheses.

Carrell (1991) was interested in discovering if L1 (Spanish) reading ability was the main factor responsible for L2 (English) reading ability or if it had to do with language proficiency in

L2. Her study focused on college Spanish-speaking students that were taking advanced ESL classes. Similarly, Bernhardt and Kamil (1995) conducted a study that focused on native English speaking college students that were tested for their reading level in both English (L1) and Spanish (L2). Both of these studies that examined college students found similar results in that L1 was a predictor of success in L2 reading ability.

Ordonez et al. (2002) focused on L1 (Spanish) and L2 (English) vocabulary skills. He found that students who possess a good grasp of vocabulary in L1 could transfer those skills to L2 thus allowing them to have better oral language abilities. Thus, the vocabulary knowledge that the bilingual person has in L1 can be transferred to improve reading skills in L2. Carlisle and Beeman (2001) studied L1 (Spanish) and L2 (English) oral language skills and later its effect on L2 reading comprehension. Their results indicate that students with limited primary language development who are in the early stage of learning a second language should focus on vocabulary development in both L1 and L2 simultaneously because this knowledge will impact reading comprehension. Similarly, Proctor, August, Snow and Carlo (2006) examined the effects of vocabulary knowledge in the Spanish language in predicting reading comprehension in English. The results indicate that in order to become fast English readers, students must develop vocabulary knowledge in their first language (Spanish), which allow the students to transfer that knowledge to understanding vocabulary in English, which in turn aids reading comprehension. Meschyan and Hernandez (2002) explored native English speakers that were learning Spanish. The researchers observed that students who had fair decoding skills in their native language (English) were able to achieve higher scores in a competency test that measures grammar, Spanish vocabulary, and reading comprehension.

There were some studies that combined skills in L1 and examined their impact on similar skills in L2. Wakabayashi (2002) focused on three skills (reading, writing and speaking) and examined the effect that L1 (Japanese) has on L2 (English) language proficiency. His study looked at an English-only school in Japan. The participants were divided into two groups. The first group was comprised of students that were given English only instruction and the second group consisted of students that originally were schooled in the Japanese language and then later learned English. The results of the tests assessing the three skills revealed that no significant difference exists between students primarily educated in English and those that began school learning Japanese. A recent study conducted by Sparks et al. (2009) studied long-term L1and L2 relationships. Their findings support the Linguistic Coding Differences Hypothesis. Sparks and colleagues found that the early development of L1 skills have a strong correlation with L2 learning.

***Critique of studies.*** All of the previously mentioned studies stated that native language proficiency in L1 contributed to developing language proficiency in L2. However, there are four limitations among the cited studies. First, a couple of studies above divided ESL students into language proficiency levels based on the course title that they were currently enrolled in at the time of the study (Carrell, 1991; Bernhardt & Kamil, 1995). This is considered a weakness because ESL students need to be tested to determine exact level of English proficiency and to explore if it has a correlation with first language proficiency. This study used ELPA to assess English language proficiency and then place the students into the proper level of English language proficiency based on scores of reading, writing, listening and speaking.

Second, some of the studies mentioned above focused on one or two language skills in either L1 or L2 to show a relationship between the variables (e.g.,Wagner, Spratt, & Ezzaki,

1989; Sparks et al, 2008; Saad, 1990; Dakroub, 2002; Proctor, Carlo, August, & Snow 2006). This critique was also noted by Al-Fadley (2009) where she emphasized the importance of testing as many skills as possible in L1 and L2 to provide a more detailed analysis of whether a relationship exists and if so, which skills have the most impact. This study measured sentence mastery, vocabulary, pronunciation and fluency in L1 and compared it to the L2 results by measuring their reading, writing, listening and speaking in L2.

Third, some of the studies had limitations in their L1 assessment. For example, Carrell, 1991; Bernhardt & Kamil, 1995; Dakroub, 2002 all presented students with multiple-choice questions that were in L2. This is a limitation because students will draw from pictures, tables, graphs etc. to decipher the meaning and be able to answer it in English. A more accurate form of assessment is one that has all questions and answers in the first language to ensure that the student has proper knowledge in L1. The L1 assessment that was used in this study only has Arabic questions and answers. Another limitation in L1 assessment was the use of teacher-made Arabic tests (Saad, 1990; Dakroub, 2002). The use of teacher-made tests is a limitation when compared with the use of research-based standardized testing such as the Versant Arabic Test, which was used in this study to assess Arabic language proficiency. Also, in Saad's (1990) study, the teacher made test was a limitation because he tested only the Arabic slang (NSA) and overlooked the diglossic nature of the Arabic language. This study takes into consideration the diglossic nature of Arabic and so formal Arabic is tested (MSA).

Fourth, some of the studies mention the native languages used without referring to specific dialects or countries that those students came from (e.g., Proctor et al. 2006; Dakroub 2002). Proctor et al. focused on the Spanish language, which is highly spoken in many countries around the world but their study didn't provide information as to whether the students used

standard Spanish or a dialect of Spanish. Similarly, Dakroub (2002) listed this as a limitation in his study because he focused on three Arabic countries, which included: Lebanon, Yemen, and Iraq. He stated that there are 22 Arabic countries and would have wanted to represent more countries. This study includes Lebanon, Yemen, Iraq and additionally Egypt.

The above studies also have a few strengths that are worth mentioning. First, many of the studies focused on specific skills such as reading and vocabulary in L1 that had a direct relationship with a similar or different skill in L2 (Sparks et al, 2008; Ordonez et al, 2002). This study observed specific skills in L1 such as reading, writing and speaking and establish if a relationship exits with reading, writing, and speaking in L2. Second, some studies tested for a combination of skills in L1 and compared it to various skills in L2 (e.g., Wakabayashi, 2002; Meschyan & Hernandez, 2002; Gelderen et al, 2007). Additionally, this investigator has assessed a combination of skills that included sentence mastery, vocabulary, fluency and pronunciation. Third, some studies gathered participants from one educational level. For example, (Saad, 1990) limited his study to elementary schools students, (Dakroub, 2002) investigated middle school students, and (Carrell, 1991; Bernhardt & Kamil, 1995) focused on college level students. Given that each of the researchers focused on a single educational level, they had the opportunity to work with a larger homogenous sample than studies that focus on multiple educational levels but have a smaller sample. Choosing participants from one educational level is considered strength because it allows the researcher to observe many students from a certain educational level allowing for better generalization of results. This study focused on 11$^{th}$ grade high schools students. Fourth, there were studies that had one (Carrell, 1991) or two groups (Wakabayashi, 2002) of students that were placed in ESL levels based on their exposure to English. This study

placed students into three groups that consist of beginning, intermediate and advanced students based on their ELPA scores.

**Empirical perspective of L1 and its relationship to science academic achievement**. There are empirical studies, which include the effect of L1 on general achievement and science achievement that have their underpinnings based on Cummins's Theory. In this section, the investigator will first examine general studies that include the role of first language proficiency (L1) and its effect on general academic achievement in English (Thomas & Collier, 1997; Saville-Troike 1984; Torres, 1996; Dakroub, 2002; Saad, 1990). Second, the investigator examined studies that focus specifically on science academic achievement in English (Calderon, 2003; Tobin & McRobbie 1996; Kearsey & Turner, 1999; Lynch et al, 1985). The critique of the studies will be reviewed at the end of the section.

***Summary of studies***. Thomas and Collier (1997) studied the effects of first language proficiency on academic and cognitive achievement of Koreans, Vietnamese, Hispanics, and Cambodians. They reported that students who received formal schooling in their first and second language simultaneously experienced academic gains and did better than their native-English speaking peers. As was expected, Thomas and Collier observed that formal schooling in the mother-tongue language was the strongest determinant of academic success in the second language.

Saville-Troike (1984) focused on ESL students from seven language backgrounds, which included: Korean, Spanish, Icelandic, Polish, Japanese, Hebrew and Arabic. The students had very little or no English background at all. Using the Comprehensive Test of Basic Skills (CTBS), she tested the students' abilities in reading, language, social studies, mathematics and science. Saville-Troike (1984) had many independent variables and one that is of relevance to

this study is native language proficiency. She had many ESL findings in order to state what really mattered in second language learning. Among the findings was that there is a positive relationship between native-language reading and second language English reading. Also, having English proficiency also meant higher scores in social studies and science in English. Torres (1996), on the other hand, focused on the highest achieving Mexican-American students that were the top 10 % of their class. She found that the main commonality among these high achievers is that they maintained and valued their home language (Spanish), which turned out to be a valid indication of future second language success. Therefore, the above two studies show that at various levels of English proficiency, those students who have native language literacy will continue to succeed in academic coursework.

Saad (1990) studied the effect of L1 (Arabic) on mathematics and cognitive ability in English, while Dakroub (2002) focused on L1 (Arabic) and its impact on mathematics in English. They both focused on the Arabic speaking population in the same school district. However, Saad (1990) studied elementary school students while Dakroub (2002) focused on middle school students. Saad (1990) used the Iowa of Basic Skills test while Dakroub (2002) used the Terra Nova. They both grouped the students into high L1 and low L1 proficiency and discovered that a positive relationship exists between Arabic language proficiency and content achievement in mathematics.

Tobin and McRobbie (1996) performed a qualitative research studying ELL high school Chinese students trying to understand a chemistry class instructed in English. These Chinese students were driven with a strong commitment to learn, and high work ethic. They used Cantonese in their written and oral expressions. Despite their positive attitudes and willingness to learn, their comprehension of subject matter was hindered by their difficulties in English. The

results clearly showed that using English only as a medium of instruction was setting these students up for academic failure. The researchers concluded that to successfully learn chemistry, these Chinese ELL students should be given the opportunity to use their native language as a tool to understand the subject.

Kearsey and Turner (1999) studied the idea of bilingualism as it relates to cognitive achievement in secondary schools in the United Kingdom (UK). They identified bilingual and monolingual students and assessed their comprehension of information in a science textbook. They noted that bilingual students demonstrated improved understanding because of the use of supplemental materials in their native language to aid in the understanding of the curriculum. This was an advantage over the monolingual students because bilingual students are accustomed to using information from other resources, which indicate that they take on an active form of learning.

Lynch, Chipman, and Pachaury (1985a) examined if there was an association between students' native language proficiency and degree of westernization and the effect that had on understanding science concepts. The study involved English-speaking students in Australia, Hindi-speaking students from India, and Tagalog- and B'Laan-speaking students from the Philippines. Lynch and colleagues found that among the Hindi-speaking students, linguistic factors in their primary language helped them in understanding science concepts in English.

Calderon (2003) explored both Spanish and English language proficiency on science academic achievement in English of Spanish-speaking students. Calderon's study included approximately 40 students that were placed in two groups. The first group consisted of students with adequate formal schooling in their native language while the second group was comprised of students who didn't have any schooling in their native language. The results revealed that

most of the students who had received formal schooling in L1 verified higher proficiency in both Spanish and English as well as obtained higher science scores than those students with limited or no formal schooling in L1. Similary, Farrel (2011) explored 1262 students who spoke both Maltese and English and were taught both languages simultaneously since the age of 5. He reported that students who were proficient in both L1 and L2 had higher achievement in physics and mathematics than students who were only proficient in one language.

***Critique of studies.*** Overall, all of the mentioned studies reveal that L1 proficiency positively influenced academic achievement. However, the cited investigations have three limitations. First, both Saad (1990) and Dakroub's (2002) studies tested for the relationship of first language proficiency on mathematics. It is well known that mathematics is a universal language of predominately numbers and one that doesn't require an extensive knowledge of vocabulary and comprehension of words in the second language L2 in order to succeed. Therefore, the impact of L1 on mathematics would be limited. An alternative approach could be examining the impact of L1 on some curriculum areas where words are predominantly used (e.g., scientific vocabulary) as in the case of the science curriculum. Therefore, this study assessed if first language proficiency had an effect on science achievement in English.

Second, two of the studies failed to test for first language proficiency to examine if it had a direct impact on science achievement in English (Tobin & McRobbie, 1996; Kearsey & Turner, 1999). Rather, the investigators in the studies chose participants that had languages other than English as their primary language and assessed their interpretation of scientific text in English. Failing to test for first language proficiency limits the findings. For example, in their discussion, Kearsey and Turner give possibilities as to why some bilingual students faced obstacles in scientific writing in English. One of the reasons given was that students might not

have had competency in their first language, which therefore, contributed to linguistic interference. In their study, it was stated as a possibility whereas in this study, the investigator assessed first and second language to examine the transfer of skills in L1 and L2, which were analyzed as findings.

Third, many of the studies written about L1 and its relationship to science achievement in English focused on the understanding of science concepts without using a formal or standardized science achievement test (e.g., Lynch, Chipman, & Pachaury 1985a; Tobin & McRobbie, 1996; Torres, 1996). In Tobin and McRobbie's study (1996) investigators examined the data that was collected from a chemistry teacher using the Classroom Environment Survey developed by Tobin, and interviews. When a survey is given to students and they are asked to rate their level of understanding, then they are likely to give socially desirable responses of their performances. This is because they are evaluating themselves. In this study, the investigator instead used an assessment that directly evaluated the level of comprehension and provided a score that represents the level of knowledge and comprehension of the content.

There were two strengths in the above studies that are worth mentioning. First, the relationship of first language proficiency to academic achievement included a wide range of languages, which are**;** Spanish (Calderon, 2003; Torres, 1996), Arabic (Saad, 1990; Dakroub, 2002) Chinese (Tobin & McRobbie, 1996) and Hindi (Lynch, Chipman & Pachaury; 1985a). Thomas and Collier (1997) also assessed Koreans, Vietnamese, Hispanics, and Cambodians all in their own language. This study also used Arabic population, which is similar to Saad (1990) and Dakroub (2002) studies.

Second, some studies used formal standardized tests (Calderon, 2003; Saville-Troike (1984); Saad, 1990; Dakroub, 2002). When these tests are reliable and valid in determining the

scores on academic achievement then it is strength of a study. Hence, this study used Michigan Merit Examination (MME) of the Michigan Department of Education because the levels and scoring include a statewide committee that includes teachers, administrators, counselors, curriculum specialists, parents, and business leaders, who work together to develop cut scores that determines what score belongs to each level (MDE, 2008-2009).

In summary, chapter 2 provides theoretical and empirical evidence that first language proficiency is related to second language proficiency (English) and science academic achievement in English. In the next chapter, a detailed discussion of the methodology of this study is presented.

## Chapter 3: Methodology

The purpose of this study is to examine the relationship between: 1) first language proficiency (Arabic) and second language proficiency (English): 2) first language proficiency and science academic achievement in English. The methodology reported below will address the two questions and the two related hypotheses. This chapter includes research design, setting and participants, instrumentation, procedure, and data analysis.

### Research Design

A causal-comparative research design is selected for this proposed study. According to Charles (1998), a causal-comparative educational research is one that identifies and compares a cause and effect between the independent and dependent variables. According to Charles, a causal-comparative doesn't manipulate the independent variable because it has already occurred, but provides a possible cause for the differences that already exist between groups of individuals.

In this study, a causal-comparative design examined the relationship between first language proficiency (independent variable) and English language proficiency and science academic achievement in English (dependent variables).

### Setting

The setting for the proposed study includes a high school located in a large suburban school district in South Eastern Michigan. This school district has the largest percentage of Middle-Eastern students with Arabic as the primary language spoken by ELL students (M. Sedgeman, personal communication, January 10, 2009). Furthermore, this high school has a bilingual/ESL program whose main goal is to teach academic content in English in a sheltered instruction manner until the students are competent enough to be placed in mainstream classes. This type of program is referred to as "transitional bilingual programs" (Baker, 2006). To

elaborate further, when an ELL student has finished testing for English language proficiency, he or she will have an individualized plan that involves proper placement into the appropriate level of ESL where instruction is done in English with Arabic translation as support. If the student reaches a high level of English proficiency, then the Arabic language is seldom used and the student is transitioned into an English only classroom (personal communication with the high school principal, February 15, 2009).

**Participants and Sample**

The subjects of the study were selected on a nonrandom, purposive sampling basis as they met three specific criteria. The three criteria for inclusion in this study were: First, the subjects must be 11$^{th}$ grade students who were enrolled in ESL or bilingual classes. Second, ELPA scores must vary from beginning to proficient, which will allow all three levels (beginning, intermediate, advanced) of ELL proficiency to be represented. Third, the subjects must be from different Arabic countries to provide a representative sample that reflects the extent of their educational experiences in their native Arabic countries. There were 60 students in the sample from the chosen high school.

**Instrumentation**

The instruments for collecting data in this study were the following: Individual Student Form (ISF), Science component of the Michigan Merit Examination (MME), English Language Proficiency Assessment (ELPA) and Versant Arabic Test (VAT).

**Individual student form (ISF**). The Individual Student Form (ISF) was designed by this investigator to secure information from the participants pertaining to the level of ESL class, gender, length of time in the U.S., number of years of formal schooling in L1, grade, VAT scores, date of birth, etc., (See Appendix A). This form will also incorporate information from

Student Enrollment Records that include: 1) grade point average, 2) level of ELPA, and 3) MME numerical and categorical scores.

**Michigan Merit Examination (MME)**. The Michigan Merit Examination (MME) was developed by the State Board of Education to assess the variables of four content areas: language arts, math, social studies and science in English (MDE, 2008-2009). The purpose of the MME was to ensure that students across the state were taught based on the content standards developed by Michigan educators. According to the Office of Educational Assessment of the Michigan Department of Education, there is no other test that can assess the knowledge of the students based on Michigan content and performance standards. The MME science tests are given to certain grade levels across elementary, middle and high school. This study focuses on 11$^{th}$ grade MME science scores at the high school level.

The MME science test provides categorical scores that consist of four levels, which have been determined by a group of educators chosen by the state. The four levels include: level 1 which indicates that a student has exceeded Michigan standards and benchmarks for each subject, level 2 signifies that a student has met the Michigan standards and benchmarks for each subject, level 3 is a basic endorsement and level 4 is failing which the State does not endorse. Therefore, in order to pass, students must be in levels 1-3. These levels are consistent across the content areas (MDE, 2008-2009).

The Office of Educational Assessment looks at data in many ways to ensure reliability and validity. Reliability of the MME is measured by using raw scores for both Cronbach's Coefficient Alpha and Rasch model reliability (MDE, 2008-2009).

To ensure validity, a content committee and a bias committee are created for a specific purpose. The content committee checks each item on the test to evaluate its correlation with the

State standards and benchmarks for each subject. A bias committee is formed to review the test items to guarantee that the test is fair for all students. Also, the test is piloted in randomly selected schools where a p-value is configured and analyzed. If less than 30% of the students give an incorrect answer to a question, then that specific item is re-evaluated and comments and suggestions are given by teachers as to whether that test item should be removed. Construct validity is measured by examining all the questions under each section of the test and making sure that all similar questions follow a specific section, which is the case with the MME. Finally, criterion validity is measured by predicting future performances of student success. Educators have shown that MME scores and future student performance have a positive correlation (MDE, 2008-2009).

**Michigan English Language Proficiency Assessment (MI-ELPA).** The ELPA was also developed by the Michigan Department of Education to assess reading, writing, listening and speaking skills of all English language learners (MDE, 2009). The purpose of the test is to follow and observe the English language development of ELL students (MDE, 2009). Educators use ELPA for two main reasons. It gives the state and the school a clear idea of their level of English language competency. Also, it allows for accurate placement of ELL students into ESL and mainstream classes (M. Sedgeman, personal communication, January 10, 2009).

The raw scores on the ELPA are transformed into scale scores, which are used to determine performance levels in English. The ELPA scores are then divided into four English proficiency levels: (a) basic (student has minimal or no English skills in the areas of listening, speaking, reading and writing), (b) low intermediate (student has partial English skills in the four language facets mentioned above), (c) high intermediate (student has near-sufficient English

skills in the four language facets), and (d) proficient (student has sufficient English skills in the four language facets) (MDE, 2009).

According to the ELPA Technical Report (2009), the ELPA has evidence of both reliability and validity. For example, ELPA provides internal consistency by using Cronbach coefficient alpha of .94 and a Standard Error of Measurement (SEM) of 3.87. It also provides information on inter-rater reliability (or agreement), and the reliability of classification decisions at the proficient cut. The accuracy of classification into different ELPA levels ranged from 89% to 94% through all grades.

The ELPA was also examined to ensure content, internal, and external validity (MDE, 2009). According to the ELPA Technical Report (2009), a team of experts in the field of ESL was gathered to create the Content Advisory Committee (CAC). The purpose of CAC was to make sure that the content being assessed is aligned with the English language proficiency standards.

To show evidence of internal validity, the Pearson correlations (*r*) were used to evaluate the five sections of the ELPA, which include reading, writing, listening, speaking and comprehension and the overall ELPA score. The main reason for using Pearson correlations is to examine how similar the sections are to each other and to the overall ELPA score. The researchers show evidence of positive correlations, which indicates a strong degree of internal validity. Finally, to show evidence of external validity, the researchers compared the ELPA to the MME. They found a positive correlation between the ELPA and the English language section of the MME. Moreover, there was a positive correlation with other content areas as well. Therefore, a student who does well on ELPA is expected to do well on the MME.

**Pearson's Versant Arabic Test (VAT).** This Arabic test is designed by Pearson Education Incorporation (2009) to assess sentence mastery, vocabulary, fluency and pronunciation of Modern Standard Arabic (MSA). The purpose of the VAT is to measure the Modern Standard Arabic (MSA), which is the formal Arabic used by educators and professionals (Pearson, 2009).

The VAT consists of four sections and each of the sections is scored from 20 to 80 and then an overall score that is the average of all four skills is reported. A student who scores in the 20-40 range is labeled as beginning level or level 1 (student has partial skills in the MSA). A score from 40 to 60 signifies an intermediate level or level 2 (student has near proficient skills in MSA) and 60 to 80 is advanced level or level 3 (student has mastered language proficiency in MSA).

The Versant Arabic Test has reports supporting reliability and validity. The VAT is reliable because a standard error of measurement (SEM) is taken to give an overall estimation of the degree of error in each student's test score. Furthermore, according to Brown (1999), SEM is used to provide information about reliability because it provides the measurement errors that interfere with the students' true actual score. Brown elaborates that there are two scores which include the observed score and the true score. The observed score is the sum of the true score plus the error of measurement. Therefore, in order for a researcher to obtain the true actual score, the SEM must be as low as possible. The lower the SEM, the more reliable the measurement will be.

According to Pearson Education (2009), the overall score of SEM for the VAT is 2.2. In order to figure out the SEM, the researcher needs to know the reliability coefficient. Score reliabilities for the VAT were examined by two methods that include; split-half method and the

test/ retest method. The overall score of split-half reliability is .98 and .97 for the test/re-test reliability. To calculate SEM, the test reliability (.98) was subtracted by one and the square root of that number was taken and multiplied by the standard deviation (16.6) of the VAT test to give the overall score of 2.2 for SEM (Pearson, 2009).

The VAT is also examined for internal and external validity. Internal validity is the extent of how well the test assesses what it originally planned to assess. Researchers investigated to see if VAT has scores that are consistent with both computerized and human ratings (Pearson, 2008). Furthermore, correlations between sub-scores and the overall VAT score were conducted and a positive correlation was found. Another aspect of internal validity was found by comparing groups such as native Arabic speakers to non-native Arabic speakers, or educated native Arabic speakers to uneducated native Arabic speakers. As expected, educated native Arabic speakers did better than the uneducated native speakers. Therefore, the VAT has internal validity because it accurately assesses the formal Arabic language that is spoken by educated native speakers.

External validity is the degree of similarity that the VAT will have to other tests in the same field that are well known. According to Ordinate Corporation (2007), external validity was observed by comparing the VAT to two well known nationally recognized tests called the Test of English as a Foreign Language (TOEFL), and the International English Language Testing System (IELTS). Specifically, the comparison was done among TOEFL speaking, the Versant, and the IELTS interview. The correlation between Versant and TOEFL is .75. The same correlation was found between Versant and IELTS. However, the TOEFL and IELTS had a correlation of .67 and .68. The results reveal that Versant had a strong degree of correlation with both exams indicating that it has external validity.

The VAT has theoretical underpinnings of both the psycholinguistic and social-communication processing system (Bernstein, Rosenfield, Townshed, & Barbier, 2004). To elaborate further, a psycholinguistic perspective of language proficiency emphasizes that those people who are proficient in the language will apply skills that are involved in language automatically. Therefore, a student who possesses automatic control of the Modern Standard Arabic will be able to master the content type questions on the VAT, which include sentence mastery and vocabulary assessment. On the other hand, the social-communication perspective of language proficiency emphasizes that language is not separate from communication (Bernstein et al., 2004). Therefore, to assess a student's knowledge of language competency, the student must communicate the answers to reveal illocutionary actions as suggested by Bernstein et al. Illocutionary action represents the intelligent way of speaking which indicates that a student has had formal education (Steinmann, 1978). For example, using the VAT will allow this investigator to have information on the degree of knowledge in Modern Standard Arabic, which will be a reflection of the extent of formal education received by students in their native countries.

Fox and Fraser (2009) provide a review of the Versant Spanish Test (VST) and found that the VST focuses mainly on the psycholinguistic view due to the fact that the test is context-free. Therefore, the student must rely only on his or her knowledge to answer questions without having pictures, or context-clues available to help students decipher the meaning or response. Moreover, Fox and Fraser did a detailed study about reliability, validity, practicality, and overall usefulness of the VST. They concluded that the Versant Spanish Test is a very reliable test of proficiency in Spanish.

Cheng, Bernstein, Pado, and Suzuki (2009) presented a paper discussing the design and validity of the Versant Arabic Test (VAT). They claim that in order for educators to be successful in teaching the language of Spanish, English or Arabic, it is essential to know the students' proficiency levels. In their paper, they presented evidence of reliability and validity. For example, Cheng et al. mention that approximately twenty educated native Arabic speakers from different Arabic countries wrote the contents of the test and a different group reviewed it, which aids in their defense of the VAT having content validity.

**Data Collection Procedures**

Following approval to conduct the study from the school district and Human Investigation Committee (HIC), the researcher began the data collection process. She contacted the superintendent, bilingual coordinator and principal of the high school in the chosen school district and discussed the purpose of this study in detail. The researcher then worked with the staff to select the students who were included in the study.

Prior to being in the study, parents of the students were sent a passive research information sheet to explain the purpose of the study and detail their children's involvement in the data collection. The use of a passive consent form provides information to the parents regarding the research study, but does not require the return of a signed consent form to allow their children to participate in the study. Telephone numbers for the researcher and the HIC office were included on the consent form if parents had any questions about their child's participation in the research. Because some parents may not be able to read English, the passive consent form was provided in both English (See Appendix A) and Arabic (See Appendix B). The Arabic translation was certified and notarized by two experts in the Arabic language. Two copies of the consent form (English and Arabic) were mailed to the parents via the United States Postal

Service. The researcher included a preaddressed, postage-paid envelope for the parents to return the signed consent form to the researcher.

The students who met the criteria for the study, and whose parents had given permission to participate, met with the researcher in small groups. The researcher then explained the purpose of the study and why they had been selected to be a part of this research. Moreover, the researcher discussed possible benefits that they or future students will have because of their willingness to participate in this study. The students then received an adolescent assent form in English (see Appendix C) and Arabic (see Appendix D). The Arabic translation was certified and notarized by two experts in the Arabic language. The adolescent form explained the purpose of this study as well as the possible benefits and included the students' signature if they were willing to participate. The researcher then collected the signed forms and allowed the students to retain a copy for their records.

The researcher then worked with the staff to set up days to administer the Versant Arabic Test to the selected participants. The investigator had a list of all the participating students and scheduled a convenient time after school to test the students.

The VAT was administered using the telephone and had a supplementary test paper with clear directions. The students first received the test paper, which is a one single paper with information on both sides. The first side of the paper has directions and procedures (see Appendix F) and the opposite side has the telephone number to call along with the test identification number (see Appendix G). Each student was assigned a different test identification number that will enable the results to be confidential. The student then began to interact with the voice spoken on the phone and answer the questions. The test has six parts, which include

reading, repeats, short answer questions, sentence builds, and passage builds. The VAT test was very easy to administer and took about 17 minutes for each student to complete.

Once completed the investigator retrieves the students' scores from a secure website. There are two pages for the score report. The first page includes the test identification number that was being accessed as well as the date and time of test completion. Furthermore, the overall score was reported as well as the breakdown into sub-skills, which includes sentence mastery, vocabulary, fluency, and pronunciation (Appendix G). The second side of the report explains each of these sub-skills in greater detail (Appendix H). After the test was completed, the students were asked to provide information as to their country of origin, number of years in the United States, and the level of ESL they are currently in. They wrote their information on the Independent Student Form (ISF), which was created by this investigator (see Appendix I). This information is useful only to verify that the Student Records at the high school provides accurate information about the student. This is a double measure to make sure that the information provided by the school matches the information provided by the students. If there is any discrepancy, then the researcher will contact the parents to make sure the accurate information is obtained.

The remaining data was obtained from student records: English Language Proficiency Assessment (ELPA) scores, and MME science scores. This data was transferred from student records onto the Individual Student Form (ISF) developed by the researcher, which later was deleted to preserve the students' confidential records.

**Data Analysis**

The data was analyzed using descriptive and inferential statistics from the Michigan Merit Examination (MME) Science Test, English Language Proficiency Assessment (ELPA) and

the Versant Arabic Test was administered to the selected students participating in this study. Descriptive statistical procedure was used to simplify, organize, and summarize the information collected from the MME, ELPA and VAT instruments. On the other hand, inferential statistics was used to make inferences about the population sample by performing a test of statistical significance.

**Descriptive statistics.** The descriptive statistical procedures that were used in this study include demographic statistics, frequency distributions of the assessment (MME, ELPA and VAT exams) and, and measures of central tendency to summarize data from the test scores. The demographic statistics includes the ethnic background of the population sample, ESL level, gender, and age. The frequency distributions of the assessments used in this study include the mean and standard deviations for each assessment. MME, ELPA and VAT test scores were provided as interval scores.

**Inferential statistics**. The researcher in this proposed study used inferential statistics specifically the multivariate regression analysis to assess the effect of the molar independent variable Arabic language proficiency on the two molar dependent variables, English language proficiency and science academic achievement. The data will be analyzed by using SPSS – Windows, ver. 17.0. A criterion alpha level of .05 will be used to determine the statistical significance of the inferential analyses. The statistical analyses that were used to address each of the research questions and associated hypotheses are presented in the following table.

Table 2: *Statistical Analysis Table*

| Research questions/ Hypotheses | Variables | Statistical analyses |
|---|---|---|
| 1. Is there a relationship between a) Arabic language proficiency as measured by the Versant Arabic Test (VAT) and b) English language proficiency as measured by the English Language Proficiency Assessment (ELPA) of 11th grade Arabic speaking English language learners?<br><br>2. Is there a relationship between a) Arabic language proficiency as measured by the Versant Arabic Test (VAT) and b) science academic achievement in English as measured by science grade point average, and by the Michigan Merit Education (MME) of 11th grade Arabic speaking English language learners?<br><br>$H_1$ There is a relationship between a) Arabic language proficiency as measured by the Versant Arabic Test (VAT) and b) English language proficiency as measured by the English Language Proficiency Assessment (ELPA) of 11th grade Arabic speaking English language learners?<br><br>H2 There is a relationship between a) Arabic language proficiency as measured by the Versant Arabic Test (VAT) and b) science academic achievement in English measured by science grade Point average, and by the Michigan Merit Examination (ME) of 11th grade Arabic speaking English language learners? | <u>Outcome variables:</u><br><br>1. English language proficiency (interval) As measured by English Language proficiency Assessment (ELPA)<br><br>2. Science academic achievement in English (interval) as measured by the MME<br><br><u>Predictors:</u><br><br>1. Arabic language proficiency (VAT) subscales (interval) as measured by the Arabic language Proficiency Assessment. The subscales were listening, vocabulary, reading, and speaking. | Multivariate Regression Analysis was conducted to test the main effect of Arabic language proficiency on English language proficiency and science academic achievements.<br><br>A significant test was obtained; therefore, univariate follow-up tests were performed on each predictor.<br><br>A follow-up hypothesis testing for each predictor was conducted to determine whether each of the predictors had a statistically significant effect across all regression equations simultaneously, holding the impact of the other predictors constant; Those tests were based on the F statistic with a degrees of freedom of (p-1, n-k), where p is the number of criterion variables and k is the number of parameters. |

## Chapter 4: Data Analysis and Results

This chapter is divided into two sections: descriptive analysis and inferential analysis. The descriptive analysis simply describes the data obtained in the research and presents the information in an organized matter that is easy to understand (Howell, 2004). The descriptive analysis section will discuss the demographic information of the student sample as well as the descriptive statistics gathered from the three assessments: VAT, ELPA, and MME. Inferential analysis is the process of looking deeper into the data to make conclusions or "infer" if there are relationships between groups or not (Trochim, 2006). Therefore, the inferential analysis section will discuss the statistical procedure as well as follow up testing that was conducted to analyze the relationship between VAT, ELPA and MME.

### Descriptive Analysis

The demographic information of the student sample was gathered using the Individual Student Form (ISF). The following table (Table 1) lists the demographic background of the participants, which includes their country of origin, age, gender and ESL level. The ESL levels include; level 2 (low intermediate), level 3 (high intermediate), and level 4 (proficient). The total number of participants was sixty (N=60). Therefore, the percentages in the table below are calculated by dividing number of students (N) by the total number of participants (60). The majority of the participants were from Iraq (38%) and Lebanon (33%).

Table 3

*Demographics of the Student Sample*

| Individual Student Form (ISF) | Number (N) | Percentage (%) |
|---|---|---|
| Country of Origin | | |
| Iraq | 23 | 38% |
| Lebanon | 20 | 33% |
| Yemen | 15 | 25% |
| Egypt | 2 | 3% |
| Age | | |
| 19 | 6 | 10% |
| 18 | 24 | 40% |
| 17 | 30 | 50% |
| Gender | | |
| Male | 19 | 32% |
| Female | 41 | 68% |
| ESL Level | | |
| 2 | 21 | 35% |
| 3 | 12 | 20% |
| 4 | 17 | 28% |

The second table (Table 4) represents the descriptive statistics for the student sample, which includes the list of all the assessments that were given to students as well as the mean and standard deviation. The mean is the average score attained for each assessment and the standard deviation is the dispersion or degree of variance that is either close or far from the mean. If the standard deviation number is low, then the scores are close to the mean (Howell, 2004). For

example, the standard deviation for ELPA comprehension is (SD=3.51), which signifies that the data points are very close to the mean.

Table 4

*Descriptive Statistics for the Whole Sample*

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| MME Science | 60 | 950 | 1141 | 1085.80 | 43.98 |
| ELPA Comprehension | 60 | 59 | 72 | 65.38 | 3.51 |
| ELPA Listening | 60 | 58 | 74 | 67.18 | 3.78 |
| ELPA Overall | 60 | 594 | 677 | 640.23 | 28.25 |
| ELPA Reading | 60 | 56 | 69 | 65.13 | 3.34 |
| ELPA Speaking | 60 | 58 | 78 | 69.68 | 6.03 |
| ELPA Writing | 60 | 57 | 74 | 64.88 | 4.91 |
| Versant Overall | 60 | 45 | 75 | 62.12 | 7.37 |
| Versant Sentence Mastery | 60 | 44 | 80 | 63.17 | 9.15 |
| Versant Vocabulary | 60 | 42 | 80 | 64.15 | 9.32 |
| Versant Fluency | 60 | 40 | 80 | 58.93 | 8.70 |
| Versant Pronunciation | 60 | 41 | 80 | 62.93 | 10.30 |

**Inferential Analysis**

This section will discuss the steps taken to evaluate the relationship between the variables. The first step is the correlation analysis, which is normally done before the main analysis in order to see how the independent and dependent variables correlate. The second step is the multivariate regression analysis. Multivariate regression is a technique used to evaluate the relationship between multiple predictor (independent) variables and multiple outcome (dependent) variables (B, Ozkan, personal communication, July 25, 2011). This analysis involves running multiple linear regressions predicting each outcome by the given set of predictors. Six linear multiple regressions were run and the significance of each model was examined. The third and final step of this analysis is the follow up test. The follow up test examines the individual

significance of each predictor across all regression equations. The results of the inferential analyses will be reported following a brief review of the hypotheses.

**Hypothesis 1 and 2.** The first hypothesis states that there is a relationship between a) Arabic language proficiency as measured by the Versant Arabic Test (VAT) and b) English language proficiency as measured by the English Language Proficiency Assessment (ELPA) of 11th grade Arabic speaking English language learners. The second hypothesis states that there is a relationship between a) Arabic language proficiency as measured by the Versant Arabic Test (VAT) and b) science academic achievement in English as measured by the Michigan Merit Education (MME) of 11th grade Arabic speaking English language learners.

Both hypotheses were analyzed with the same statistical procedures because they both have the same independent variables. Table 3 presents all the variables in the study.

Table 5

*Independent and Dependent Variables*

| Predictors (Independent Variables) | Outcome Variables (Dependent Variables) |
|---|---|
| Hypothesis 1 and 2<br>• Versant Sentence Mastery<br>• Versant Vocabulary<br>• Versant Fluency<br>• Versant Pronunciation<br>• Versant Overall | Hypothesis 1<br>• ELPA Comprehension<br>• ELPA Listening<br>• ELPA Reading<br>• ELPA Speaking<br>• ELPA Writing<br>• ELPA Overall<br>Hypothesis 2<br>• MME Science |

The first step of this analysis was the correlation matrix, which provided a simple correlation between the variables (See Table 4). The table below lists all the outcome variables followed by predictor variables.

Table 6

*Correlation Matrix for all Variables*

| Variable | Mean | SD | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|
| MME Science | 1085.80 | 43.98 | .05 | .04 | .14 | .05 |
| ELPA Comp. | 65.38 | 3.51 | .49* | .71* | .26 | .43 |
| ELPA Listen. | 67.18 | 3.78 | .57* | .60* | .07 | .46* |
| ELPA Reading | 65.13 | 3.34 | .50* | .67* | .33 | .45 |
| ELPA Speak. | 69.68 | 6.03 | .33 | .43 | .30 | .56 |
| ELPA Writing | 64.88 | 4.91 | .45* | .47* | .35 | .38 |
| ELPA Overall | 640.23 | 28.25 | .58* | .68* | .42* | .60* |
| Predictor Variable | | | | | | |
| 1. Versant Sentence Mastery | 63.17 | 9.15 | | .70* | .29 | .49 |
| 2. Versant Vocabulary | 54.15 | 9.32 | | | .29 | .58* |
| 3. Versant Fluency | 58.93 | 8.70 | | | | .54* |
| 4. Versant Pronunciation | 62.93 | 10.30 | | | | |

*p<.05

The correlation matrix above represents all the outcome and predictor variables as well as the correlation coefficients, which is represented by the *r value*. The closer the *r* value is to ±1 means that the relationship between the independent variables and the dependent variable is strong (B, Ozkan, personal communication, July 11, 2011). The table shows that some variables have strong correlations such as ELPA comprehension and Versant Vocabulary (*r*=. 71, *p*=. 00) followed by ELPA overall and Versant Vocabulary (r=. 68, p=. 00) and the weakest correlation was between MME Science and Versant Sentence Mastery (r=. 04, p=. 86). MME Science had weak correlations with all of the predictor variables: Versant Vocabulary (*r*=. 04, *p*=. 69), Versant Fluency (*r*=. 14, *p*=. 152), and Versant Pronunciation (*r*=. 05, *p*=. 30).

A scatter plot provides a good representation of the *r* values. The figures below show the $R^2$ values. The *r* value is calculated by taking the square root of the $R^2$, which will equal the numbers in the correlation matrix. Figure 1 shows the strongest correlation between ELPA Overall and Versant Vocabulary with an $R^2$ value of .545. Figure 2 represents the weakest

correlation between MME Science and Versant Sentence Mastery with an $\underline{R}^2$ value of .002. (See Figure 2).

Figure 1. ELPA Overall and Versant Vocabulary

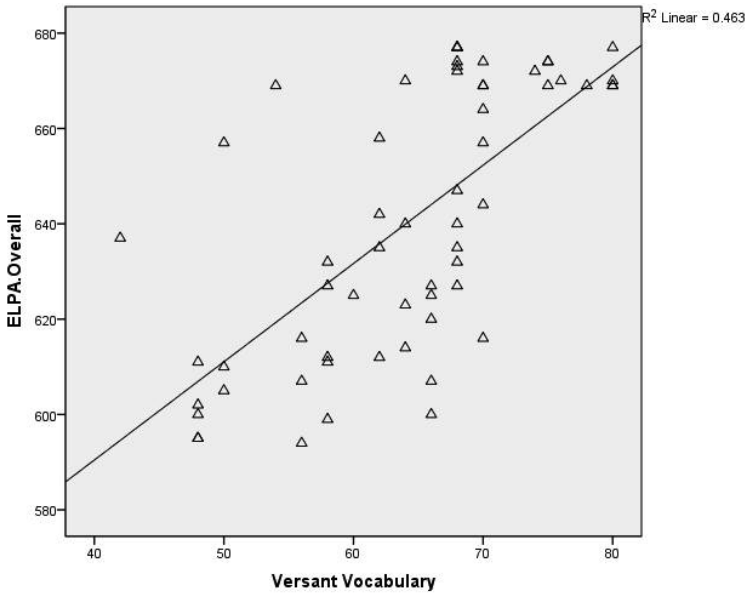
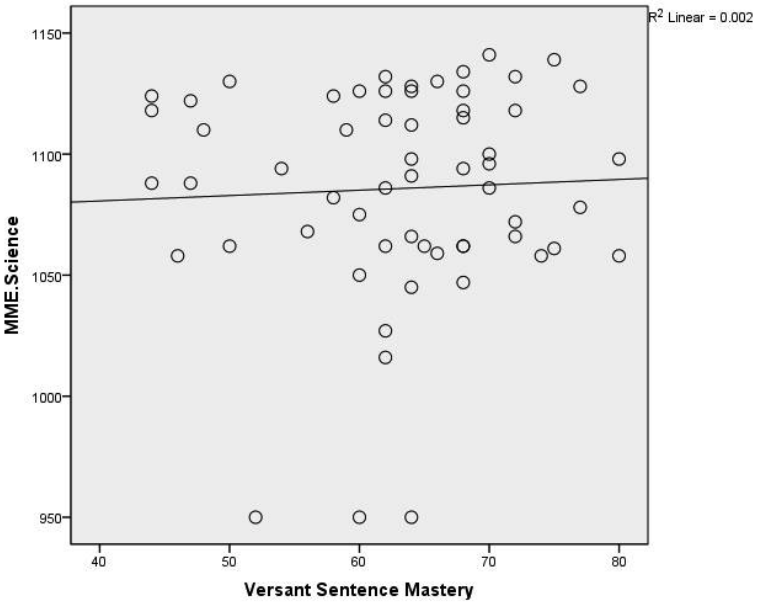



Figure 2. MME Science and Versant Sentence Mastery



The second step of this analysis was the multivariate regression analysis, which is shown in Table 5. Six linear multiple regressions were run and the significance of each model was examined.

Table 7

*Multiple Regression Findings for the Listed Outcome and Predictor Variables*

| Outcome Variables | Predictor Variables | *B* | *SEB* | *BETA* |
|---|---|---|---|---|
| **MME.Science** | Sentence Mastery | .157 | .895 | .033* |
| *F*=. 716 | Vocabulary | .434 | .939 | .093 |
| *P*= .584 | Fluency | 1.172 | .791 | .232 |
| $R^2$= .050 | Pronounciation | -1.05 | .783 | -.245 |
| **ELPA Comprehension** | Sentence Mastery | -.009 | .051 | -.023 |
| | Vocabulary | .266 | .054 | .701 |
| *F*=14.224 | Fluency | .028 | .045 | .069 |
| *P*= .000 | Pronounciation | -.001 | .045 | -.003 |
| $R^2$= .509 | | | | |
| **ELPA Listening** | Sentence Mastery | .123 | .058 | .298 |
| *F*= 11.361 | Vocabulary | .124 | .061 | .305 |
| *P*= .000 | Fluency | -.104 | .052 | -.239 |
| $R^2$=. 452 | Pronunciation | .097 | .051 | .263 |
| **ELPA Reading** | Sentence Mastery | .005 | .050 | .015* |
| *F*= 12.574 | Vocabulary | .222 | .053 | .620 |
| *P*= .000 | Fluency | .055 | .044 | .143 |
| $R^2$= .478 | Pronunciation | .002 | .044 | .008* |
| **ELPA Speaking** | Sentence Mastery | -.014 | .103 | -.021 |
| *F*= 6.810 | Vocabulary | .111 | .108 | .172 |
| *P*= .000 | Fluency | .002 | .091 | .003** |
| $R^2$= .334 | Pronunciation | .276 | .090 | .472 |
| **ELPA Writing** | Sentence Mastery | .111 | .086 | .208 |
| *F*= 5.685 | Vocabulary | .130 | .090 | .247 |
| *P*= .001 | Fluency | .112 | .076 | .199 |
| $R^2$= .293 | Pronunciation | .016 | .075 | .033** |
| **ELPA Overall** | Sentence Mastery | .429 | .394 | .139 |
| *F*= 17.05 | Vocabulary | 1.27 | .413 | .420 |
| *P*= .000 | Fluency | .486 | .348 | .150 |
| $R^2$= .554 | Pronunciation | .568 | .345 | .207 |

*p<.05, **p<.01

The above table shows the *B* coefficients, which reflect the relationship that each independent variable has with the dependent variable. The *Beta* coefficients are the same as B coefficients or regression coefficients only they are expressed in standard deviation units to assess the relative impact of the predictors on the dependent variable (B, Ozkan, personal

communication, July 25, 2011). Table 5 shows that all the models involving Versant Tests as predictor variables and ELPA as outcome variables were statistically significant. Therefore, there was a significant relationship between Versant Arabic Test and ELPA Test. Thus, the research hypothesis that states there is a statistically significant relationship between a) Arabic language proficiency as measured by the Versant Arabic Test (VAT) and b) English language proficiency as measured by the English Language Proficiency Assessment (ELPA) of 11th grade Arabic speaking English language learners was supported.

The first model with MME Science as the outcome variable did not show a statistically significant relationship between the predictor variables ($F$=. 716, $p$=. 584). Therefore, the research hypothesis that states there is a statistically significant relationship between a) Arabic language proficiency as measured by the Versant Arabic Test (VAT) and b) science academic achievement as measured by the Michigan Merit Examination (MME) of 11th grade Arabic speaking English language learners was not supported. Thus, the null hypothesis was retained.

The third and final step in this analysis is the follow up test where each predictor was evaluated separately to see if it had a significant relationship with the outcome variables. The tables below (Table 8 and Table 9) report the results of the follow up tests. Table 8 shows that Versant vocabulary, Versant fluency and Versant pronunciation were significant predictors of the following outcome variables: MME Science, ELPA comprehension, ELPA listening, ELPA reading, ELPA speaking and ELPA writing. The only predictor variable that was not a significant predictor of the outcome variables was the Versant Sentence Mastery ($F$=1.22, $p$=. 313).

Table 8

*Follow up tests for Listed Predictors and Outcome Variables: MME Science, ELPA Comprehension, ELPA Listening, ELPA Reading, and ELPA Writing*

| Predictors | *F* (6, 55) | *P* |
|---|---|---|
| Versant Sentence Mastery | 1.22 | .3127 |
| Versant Vocabulary | 6.11** | .0001 |
| Versant Fluency | 2.29* | .0480 |
| Versant Pronunciation | 2.71* | .0224 |

*$P$ < .05, **$P$ <. 01

Table 9

*Follow up tests for Listed Predictors and Outcome Variables: MME Science, ELPA Comprehension, ELPA Listening, ELPA Reading, and ELPA Writing*

| Predictors | Outcome Variables |
|---|---|
| • Versant Overall | • MME Science<br>• ELPA Overall |

Table 9 shows the second part to the follow up test that includes the following outcome variables: MME Science, ELPA Overall and predictor is the Versant Overall. Versant overall was a significant predictor of both MME Science and ELPA overall [$F$ (2, 58) =35.83, $p$=. 0000].

## Chapter 5: Discussion

The purpose of this study was to investigate the relationship between Arabic language proficiency, English language proficiency, and science academic achievement of 11th grade Arabic speaking English language learners. This section will discuss the results, limitations, and directions for future research.

The theoretical framework supporting the relationship between Arabic language proficiency (L1) and English language proficiency (L2) is based on Cummins's (1979) Linguistic Interdependence Hypothesis that discusses that the transfer of L1 to L2 will only occur if a certain level of proficiency in L1 is attained. Cummins later proposed the Common Underlying Proficiency (CUP) and the Iceberg Model (1984) to further explain the Linguistic Interdependence hypothesis which claims that L1 and L2 operate through a central processing system in the brain. Thus, reading, writing, speaking and listening in the first language will therefore, help students develop the same skills in the second language. The work of Sparks and Ganshow (1993) although intended to provide a distinction between "special needs students" and bilingual students, aided in the support of L1 and L2 transfer. The Linguistic Coding Differences Hypothesis (LCDH) suggested by Sparks and Ganshow explains that L1 and L2 have similar learning mechanisms and that a weakness in a certain skill in L1 will be later observed in L2. Last but not least, Krashen's (1982) Acquisition-Learning and Natural Order hypotheses discusses that students will follow the natural order process of learning to grasp their first language which will help them later to "acquire" their second language when there is enough exposure to L2.

The theoretical framework supporting the relationship between Arabic language proficiency (L1) and science academic achievement in English is mainly Cummins's Threshold

hypothesis (1981). The threshold hypothesis explains that a specific level of academic proficiency in the first language must occur before a cognitive transfer from L1 to L2 can be observed. Many studies were executed to support this hypothesis (Lynch, Chipman & Pachaury, 1985a; Lynch 1996a, 1996b; Thomas & Virginia Collier, 1997; Kearsey & Turner 1999; Tobin & McRobbie 1996; Calderon, 2003).

Based on the above theoretical framework and empirical findings, this investigator presented two hypotheses:

1- There is a relationship between a) Arabic language proficiency as measured by the Versant Arabic Test (VAT) and b) English language proficiency as measured by the English Language Proficiency Assessment (ELPA) of 11th grade Arabic speaking English language learners.

2- There is a relationship between a) Arabic language proficiency as measured by the Versant Arabic Test (VAT) and b) science academic achievement in English as measured by the Michigan Merit Education (MME) of 11th grade Arabic speaking English language learners.

**Discussion of Hypothesis 1**

The first hypothesis states that there is a relationship between a) Arabic language proficiency as measured by the Versant Arabic Test (VAT) and b) English language proficiency as measured by the English Language Proficiency Assessment (ELPA) of 11th grade Arabic speaking English language learners.

As it was reported in Chapter 4, the research hypothesis was supported since the analysis of the data shows that there was a significant relationship between the independent variable, Arabic language proficiency measured by the Versant Test and assessed the following sub-skills:

(sentence mastery, vocabulary, fluency, and pronunciation) and the dependent variable, English language proficiency, measured by the ELPA and assessed the following sub-skills: (comprehension, listening, reading, speaking, and writing). This study's findings were similar to previous studies observing a combination of skills in L1 and its relationship to similar skills in L2 such as Meschyan and Hernandez (2002) where they observed that having language competency in English (L1) helped to achieve higher scores in Spanish (L2) that measured grammar, vocabulary and reading comprehension. Another study by Wakabayashi (2002) focused on three skills (reading, writing, and speaking) in Japanese (L1) and English (L2). His findings revealed that learning Japanese as a first language allowed the students to be successful in learning English. Studying the long-term effects of L1 and L2, Sparks et al. (2009) support that early development in L1 skills will have a strong correlation with L2 learning.

This study also reported findings on the combination of skills in L1 and their relationship as a whole with each of the dependent variables in L2. Moreover, they also examined the relationship between sub-skills in L1 and L2. For example, the strongest relationship was found between L1 variables (sentence mastery, vocabulary, fluency, and pronunciation) combined and ELPA comprehension in L2 ($F$=14.224; $p$=.000). To be more specific, the follow up test showed that Versant vocabulary among all the L1 skills was the best predictor of ELPA comprehension and ELPA reading ($F$=6.11; $p$=.000). This is similar to Gelderen et al.'s (2007) finding where they observed that vocabulary knowledge in L1 served as a strong predictor of L2 reading comprehension. Ordonez et al (2002) also observed that a bilingual person with a good grasp of vocabulary skills in L1 could be transferred to improve vocabulary and reading comprehension in L2. Carlisle and Beeman (2001) emphasized the importance of focusing on vocabulary development in L1 because it showed a positive impact on reading comprehension in L2. Finally,

Proctor, August, Snow and Carlo (2006) examined that vocabulary knowledge in L1 allowed the students to become fast English readers.

**Discussion of Hypothesis 2**

The second hypothesis stated that there is a relationship between a) Arabic language proficiency as measured by the Versant Arabic Test (VAT) and b) science academic achievement in English as measured by the Michigan Merit Education (MME) of 11$^{th}$ grade Arabic speaking English language learners.

The analysis of the data shows that there was no significant relationship between Arabic language proficiency and science academic achievement ($F$= .716, $p$=. 584). Therefore, the research hypothesis was not supported and the null hypothesis was retained.

The results of hypothesis 2 were not similar to the findings of other studies that examined L1 and its relationship to science academic achievement (Calderon, 2003; Tobin & McRobbie 1996; Kearsey & Turner, 1999; Lynch et al., 1985). Calderon's (2003) study explored both Spanish and English language proficiency on science academic achievement. As was stated in Al-Fadley's (2010) research, Calderon focused on both L1 and L2 and explored the relationship that both skills combined had on science where in this study, the investigator examined the relationship that L1 alone had on science academic achievement. Therefore, explaining why the results of this study were not the same as Calderone's study.

Tobin and McRobbie (1996) performed a qualitative research based on observation, survey and interviews and observed the impact that L1 had on chemistry in an assigned classroom. This study used MME, which is a standardized assessment that assessed all science skills. Tobin and McRobbie did not use a standardized assessment. They assessed using observation, surveys and interviews. Furthermore, their main focus was on chemistry instead of

general science. Since, both method of evaluation and content were different, this may explain why the results of this study were not similar to Tobin and McRobbie's study. To elaborate further, chemistry alone differs from general science because it involves a lot of equations and mathematical skills. Although testing for general science will also incorporate chemistry but it also includes the other science subjects such as physics, life science, and biology and this could be another reason why the findings were not similar.

Similarly, Kearsey and Turner (1999) identified bilingual and monolingual students and assessed their comprehension of information in a science textbook. Using interviews, questionnaires, analysis of readability and cloze task data for assessing comprehension of science, they noted that bilingual students showed better understanding of science textbook when using supplemental materials in their native language to aid in understanding the curriculum. As stated in the above study, there was no standardized assessment used to measure the knowledge of all science skills as was done in this study. Also, the students showed better understanding of science concepts when given supplemental materials in their native language whereas in this study, no supplemental materials were given during the test. Therefore, these could be the two reasons why the results of both studies did not have the same outcomes.

Last but not least, Lynch et al (1985a) found that linguistic factors in primary language helped students in understanding science concepts in English. Therefore, the studies mentioned here have shown that when students are provided the support whether its L1 support or supplemental materials, the students are showing improvement in science. Again, this study did not offer L1 support or supplemental materials and was based solely on the MME science assessment.

Having compared this investigators study with all of the previous studies, this investigator has to draw one of two possible interpretations of these findings. One, her assumptions and hypothesis were wrong to begin with and clearly there is no relationship between L1 and science. Two, her assumptions and hypothesis were correct, but she didn't find a relationship because of methodological flaws. In this investigator's case, she still believes in her assumptions and research hypothesis and she thinks that the limitations of her studies didn't bring the results as anticipated.

**Limitations of the Study**

The first and main limitation in this study is that science academic achievement was measured only by a standardized test. This measure may not have been suitable for many bilingual students to determine their level of knowledge in science. As was mentioned in the previous studies, alternate forms of assessments such as discussions, interviews and surveys were given to determine the level of understanding of the students. This investigator did not use those forms of assessments which perhaps if used in this study may have lead to different results. A study that can incorporate both quantitative and qualitative measures may address this limitation. Also, different measures of formal assessments can be used. For example, MME, class tests, quizzes, presentations and reports can also be used along with interviews and surveys to give a more accurate finding of the level of knowledge in science.

A second limitation in this study is the number of participants in the research. This study had access to 60 students, which may not have been enough to see if there was a relationship between all the variables. Having at least 100 students may give more accurate results.

**Educational Implications**

The findings in this study have educational implications for administrators, teachers, students and parents. This study has shown that in order to be successful in English, students must continue to develop and improve L1 skills, which in this case is Arabic. First language proficiency as was reported in previous studies has repeatedly had a significant impact on second language acquisition, which is a key factor for success in schools.

The following recommendations are based on empirically grounded assumptions, that when information along with systematic frameworks or strategies are provided to administrators (e.g., National High School Center, 2010), teachers (e.g., Echevarria, Short & Powers, 2006), students (e.g., Zollman, 2009) and parents (e.g., Bartel 2010) it changes their behaviors. First example, when administrators were given a Response to Intervention Framework (RTI) they were able to implement programs successfully (National High School Center, 2010). Second example, research reported that when teachers were given the SIOP conceptual model, they were observed implementing it during their lesson. Researchers used the SIOP as an observation instrument and scored the teachers' lessons while teachers used it as a guideline or checklist for lesson planning (Echevarria, Short & Powers, 2006). The scores indicated that teachers were successfully implementing SIOP conceptual model in their classes. Third example, when students were guided on the use of a graphic organizer, they used it during a post-test to answer math questions. Fourth example, when parents were informed about how to become more involved then they increased their participation in school activities with their kids (Bartel, 2010).

The above examples demonstrate successful implementation of frameworks, models and strategies that have similar fundamental characteristics in that they provide specific guidelines to ensure the same desired outcome, which is the success of students. Therefore, the

recommendations stated below similarly provide administrators, teachers, students, and parents with information that includes specific guidelines for successful implementation of ELL strategies.

First, administrators who have bilingual teachers need this information in order to create, organize, and supervise bilingual programs that will allow for the enhancement and continuity of first language acquisition. According to this investigator, bilingual programs focus on only teaching English to the non-native English speakers and disregard the research (e.g., metropolitan school district) supporting the incorporation of native language proficiency into the curriculum to allow for the success of teachers and students. Such information therefore, can be included in their administrative courses, ESL/bilingual workshops, and the educational handbook of the school district that can give administrators the tools to successfully manage and organize bilingual education programs.

Second, bilingual teachers also can benefit from the significant relationship found between L1 and L2 by taking the curriculum in place and modifying it with the use of supplemental materials in students' native language to improve comprehension. Also, according to this investigator, bilingual teachers can use a successful strategy for designing and implementing lesson plans for English language learners. This strategy is called Sheltered Instruction Observation Protocol (SIOP) and has been reported to be a successful tool for helping make content comprehensible for ELL students (Echevarria, Vogt & Short, 2000). This information can be given to bilingual teachers while studying to earn bilingual education certification, during after-school meetings/workshops, ESL/bilingual seminars, district bilingual resource person, and by observing other bilingual teachers involved in successful bilingual programs.

Third, students must continue to improve their native language proficiency by reading, writing, and speaking in their native language and continue to find ways to better their understanding of their first language. Students can practice reading and writing by purchasing books, magazines or newspapers in their native language. Next, they can write a summary of what they understood to practice their writing. They can show their parents their summaries to make sure they have accurately understood the context. In terms of speaking and listening, students can join sport teams or mingle with friends from their native country and have rule that they must speak in their native language after school hours.

Fourth, parents of bilingual students must realize that their children can be successful and even outperform the monolingual students (Thomas & Collier, 1997) by continuing to speak in their native language at home and creating opportunities for their children to improve their L1 skills. According to this investigator's opinion, parents are deeply concerned about the success of their children in an English-speaking world that they have their children learn English at the cost of abandoning their native language (e.g., Genesse 2008). Parents can learn about the significant relationship found between L1 and L2 by being informed by their school through workshops designed to educate parents about the impact of their native language on L2. Also, parents can continue to be updated about this information through parent teacher associations, open house meetings, and parent-teacher conferences. Since the findings for the second hypothesis didn't show a significant relationship between L1 and science, therefore, there are no educational implications from the results of this study. However, this investigator still believes in her assumptions for generating this second hypothesis. She recognizes that it is the previously stated limitations of her study as to why her research hypothesis was not supported. Since there were

studies that supported a relationship between L1 and science (Tobin & McRobbie 1996; Kearsey & Turner, 1999), educational implications can still be drawn from the findings of those studies.

According to Tobin and McRobbie's study (1996), allowing students to speak to each other in their native language in the English science classroom helped many students to better understand the content. They suggested that bilingual students should sit close to each other during class time, so they can use their native language to explain science concepts as they are being taught. According to this investigator, this approach is successful; but, requires a lot of patience from the teacher as well as discipline and maturity from the students to make sure they stay on task and not discusses other topics outside of the content.

Kearsey and Turner's study (1999) provides educational implications for parents and the community because their findings discuss the benefits of having complete language competency in two languages. Their message is clear to the parents to continue to develop and nurture the home language and for the community to provide activities so that more interaction in the native language can take place. According to this investigator, the community can provide after school teaching of the native language to ensure students have mastered reading and writing in their home language. Parents can take their children to their home country during summer vacations where they can practice listening and speaking with other native speakers.

**Directions for Future Research and Conclusion**

Given that the second hypothesis did not find a significant relationship between Arabic language proficiency and science academic achievement, this investigator proposes a future research plan that can address the above limitations. Arabic language proficiency and its relationship to science should be studied further by using various forms of assessment to try to

give students the opportunity to express their level of knowledge in the content. Therefore, this research can undergo two kinds of modifications.

First, rather than being quantitative only, a future study should include both quantitative and qualitative measures. Second, the quantitative measure should shift from a state assessment to a nationwide assessment such as ACT and SAT. The nationwide standardized assessments will be used alongside surveys, and open-ended interviews to get a comprehensive and more of an in-depth picture of whether or not the student understands the content. This investigator suggests using similar qualitative research methods that were used in Tobin and McRobbie's (1996) or Kearsey (1999) and Turner's studies, where their results supported the relationship between L1 and science. For example, in the qualitative component of Tobin and McRobbie's study (1996), they used both participant observation and open-ended interviews. They gathered data through a variety of methods that included on live observations and videotaped lessons segments and interviews with teachers, students, and administrators. Another example in Kearsey and Turner's study (1999), through audio taped in-depth interviews with teachers, students, and administrators based on which they created case study profiles for the schools being observed. These qualitative methods along with the use of quantitative measures will allow for insightful collection of data.

In conclusion to hypothesis one, this study indicates that Arabic language proficiency had a significant relationship with English, which has been supported by extensive research. In conclusion to hypothesis two, a more sophisticated study that includes both quantitative and qualitative methods should be done to reexamine the relationship between L1 and science.

## APPENDIX A: PARENTAL PERMISSION CONSENT

Title of Study: The relationship between Arabic language proficiency, English language proficiency, and science academic achievement of 11th grade Arabic speaking English language learners.

**Purpose:**
The purpose of this information has two main goals. First, this document is to inform you about a research study that is being conducted at your child's school and second, you are being asked to allow your child to be in this research. The research study is being conducted by **Shadia Zamlut**, from the College of Education of Wayne State University to examine the relationship between native language proficiency and its effect on science academic achievement. Your child has been selected because he or she is a relatively recent immigrant to the U.S. and had some formal education in the Arabic language.

**Study Procedures**:
If you decide to allow your child to take part in the study, your child will be asked to

- Take an Arabic language proficiency test to determine how well your son or daughter reads, writes, speaks and listens in the Arabic language.
- If you have any questions, please contact Shadia Zamlut at the number below.

**Benefits:**
The benefits include knowing how proficient your son or daughter is in the Arabic language. You will receive a copy of your child's score and Arabic language proficiency level. Second, this study may show a positive relationship between the Arabic language and its impact on academic achievement, which may give the schools research to support Arabic language programs.

**Risks:**
There are no known risks at this time to your child for participation in this study.

**Costs:**
There are no costs to you or your child to participate in this study.

**Compensation:**
You or your child will not be paid for taking part in this study.

**Confidentiality:**
Your child will be identified in the research records by a code name or number. This list will be deleted from the computer when the research is completed.

**Voluntary Participation /Withdrawal**:
Your child's participation in this study is voluntary. Your decision about enrolling your child in the study will not change any present or future relationships with Wayne State University or its affiliates, your child's school, your child's teacher, your child's grades or other services you or your child are entitled to receive.

**Questions:**
If you have any questions about this study now or in the future, you may contact Shadia Zamlut at the following phone number 313-608-1978. If you have questions or concerns about your rights as a research participant, the Chair of the Human Investigation Committee can be contacted at (313) 577-1628. If you are unable to contact the research staff, or if you want to talk to someone other than the research staff, you may also call (313) 577-1628 to ask questions or voice concerns or complaints.

**Participation:**
If you do not contact the principal investigator (PI) within a 2-week period, to state that you do not give permission for your child to be enrolled in the research trial, your child will be included in the research. You may contact the PI through the following email address ai7686@wayne.edu, or call 313-608-1978.

If you do not wish to have your child participant in the study, you may fill out this form and return it to Shadia Zamlut through the following address 6315 Bauervic Blvd, West Bloomfield Mi, 48322.

I do not allow my child _____to participate in this research study.

Name

_____
Printed Name of Parent

_____ _____
Signature of Parent Date

Submission/Revision Date: 05/2010
Participant's Initials:

## APPENDIX B: THE TRANSLATED VERSION OF THE CONSENT FORM

**موافقة من الأهل / موافقة مبنية على معرفة / ورقة المعلومات**

**عنوان الدراسة:** العلاقة بين مستوى الطلاقة باللغة العربية، مستوى الطلاقة باللغة الإنجليزية والتحصيل الأكاديمي العلمي لطلبة الصف الحادي عشر للناطقين باللغة العربية ويتعلمون الآن باللغة الإنجليزية

**الغرض:**
الغرض من الحصول على هذه المعلومات هو من أجل تحقيق هدفين. الهدف الأول، هو إطلاعكم على دراسة بحثية يتم إجراؤها في مدرسة طفلك، والهدف الثاني هو الطلب منكم أن تسمحوا لطفلكم بالمشاركة في هذا البحث. الدراسة البحثية يتم القيام بها من قبل **شادية زملوط** من كلية التعليم في جامعة وين ستيت من أجل دراسة العلاقة بين مستوى الطلاقة باللغة الأصلية وأثرها على التحصيل العلمي الأكاديمي. لقد تم اختيار طفلك لأنه / لأنها قد هاجر / هاجرت إلى الولايات المتحدة من وقت قريب وحصل / حصلت على التعليم باللغة العربية في مدرسة رسمية.

**الإجراءات المتبعة في إجراء الدراسة:**
إذا قررتم السماح لطفلكم المشاركة في الدراسة، فيطلب من الطفل أن:

- يأخذ امتحان يقيس مستوى الطلاقة باللغة العربية من أجل تحديد مدى قدرة ابنكم / ابنتكم على القراءة، الكتابة، والمحادثة باللغة العربية.
- إذا كانت لديكم أية أسئلة، يرجى الاتصال بـ شادية زملوط على الرقم المدرج أدناه.

**الفوائد المرجوة:**
تشمل الفوائد المرجوة من الدراسة التمكن من معرفة مستوى طلاقة ابنكم أو ابنتكم في اللغة العربية. سوف تحصلون على نسخة من علامة الطفل التي حصل عليها في امتحان مستوى الطلاقة باللغة العربية. ثانيا فإن هذه الدراسة قد تظهر علاقة إيجابية بين اللغة العربية وأثرها على التحصيل الأكاديمي والذي من شانه أن يقدم الأبحاث للمدارس من أجل دعم برامج اللغة العربية.

**المخاطر:**
لا يوجد أية مخاطر معروفة في الوقت الحاضر

**التكلفة:**
لا يوجد أي تكلفة عليكم أو على طفلكم

**التعويضات:**
لن يتم دفع أية أموال مقابل لطفلكم مقابل مشاركته في هذه الدراسة.

**السرّية:**
سيتم تعريف طفلكم في سجلات البحث من خلال رمز أو رقم. سيتم شطب هذه القائمة من الحاسوب عندما يتم الإنتهاء من الدراسة.

**المشاركة الطوعية / الانسحاب:**
إن مشاركة طفلكم في هذه الدراسة هي مشاركة طوعية. إن قرار تسجيل طفلكم في هذه الدراسة لن يغير أية علاقة حالية أو مستقبلية مع جامعة وين ستيت أو الجهات المرتبطة بها، أو مع مدرسة طفلكم، أو مع معلم طفلكم، أو على علامات الطفل أو أي خدمات أخرى يحق لكم أو لأطفالكم الحصول عليها.

**الأسئلة:**
إذا كانت لديكم أية أسئلة عن هذه الدراسة الآن أو في المستقبل، فيمكنكم الإتصال بـ شادية زملوط على الرقم التالي 1978-313-608. إذا كانت لديكم أية أسئلة تتعلق بحقوقكم كمشاركين في البحث، فيمكنكم الاتصال برئيس لجنة الأبحاث البشرية على الرقم 1628-577-313. إذا لم تتمكنوا من الاتصال بكادر البحث، أو إذا رغبتم التحدث مع شخص من خارج كادر البحث، فيمكنكم الاتصال بالرقم 1628-577-313 لتوجيه الأسئلة أو التعبير عن هواجس أو شكاوى.

**المشاركة:**
إذا لم تقوموا بالاتصال بالباحثة الرئيسية (PI) خلال فترة أسبوعين لإخبارها بعدم رغبتكم بالسماح لطفلكم بالتسجيل في البحث التجريبي، فإن طفلكم سيتم شمله بالبحث. يمكنكم الاتصال بالباحثة الرئيسية (PI) على البريد الالكتروني ai7686@wayne.edu أو الاتصال بالرقم 1978-608-313.

إذا كنتم لا ترغبون بأن يشارك طفلكم بهذه الدراسة، يمكنكم تعبئة هذا الاستمارة وإعادتها إلى شادية زملوط على العنوان التالي:

6315 Bauervic Blvd.
West Bloomfield, MI 48322

أنا لا أسمح لطفلي _____ بالمشاركة في هذه الدراسة البحثية.
الاسم

_____
أكتب أسم الأب / الأم بوضوح

_____ _____
توقيع الأب / الأم التاريخ

تاريخ تسليم / ومراجعة الاستمارة:05/2010
الحرف الأول من الإسم و إسم العائلة للمشارك:

## APPENDIX C: ADOLESCENT ASSENT FORM

**Title:** The relationship between Arabic language proficiency, English language proficiency and science academic achievement of 11th grade Arabic speaking English language learners.

**Study Investigator: Shadia Zamlut**

**Why am I here?**
This is a research study. Only people who choose to participate are included in research studies. You are being asked to take part in this study because your native language is Arabic. Please take time to make your decision. Please feel free to ask me any questions and take time to review this study with your parents.

**Why are they doing this study?**
This study is being done to find out if students' native language proficiency has an effect on how well they do in science.

**What will happen to me?**
You will be taking an Arabic Language Proficiency Assessment called the Versant Arabic Test (VAT) to determine your level of Arabic proficiency and you will be assigned one of three levels; beginning, intermediate, or advanced. This test will only require 17 minutes of your time.

**How long will I be in the study?**
You will be in this study for as long as it takes you to finish the test and fill out a form with some basic information about your grade level, country of origin, and current ESL level. The test should take about 17 minutes and the form will require another 5 more minutes.

**Will the study help me?**
This study may help you understand your progress or lack of progress in science classes.

**Will anything bad happen to me?**
There is no expected risk that will result from you taking the Versant Arabic Test.

**Do my parents or guardians know about this?**
This study information has been given to your parents/guardian. You can talk this over with them before you decide.

**What about confidentiality?**
Your information will be entirely confidential. Each student will be given a test identification number that only the investigator will know. Your records will be kept private unless we are required by law to share any information.

**What if I have any questions?**
For questions about the study please call Shadia Zamlut at 313-608-1978. If you have questions or concerns about your rights as a research participant, the Chair of the Human Investigation Committee can be contacted at (313) 577-1628.

**Do I have to be in the study?**
It is not mandatory for you to participate in this study. You may choose to not take the VAT. Please discuss your decision with your parents and researcher. Please understand that this research may provide teachers, students and parents with hope as to what can be a factor that may help you succeed in your academic classes especially in science.

AGREEMENT TO BE IN THE STUDY

Your signature below means that you have read the above information about the study and have had a chance to ask questions to help you understand what you will do in this study. Your signature also means that you have been told that you can change your mind later and withdraw if you want to. By signing this assent form you are not giving up any of your legal rights. You will be given a copy of this form.

_____ _____
Signature of Participant Date

_____
Printed name of Participant

_____ _____
**Signature of Witness (When applicable) Date

_____
Printed Name of Witness

_____ _____
Signature of Person who explained this form Date

_____
Printed Name of Person who explained form

** Use when participant has had consent form read to them (i.e., illiterate, legally blind, translated into foreign language).
Submission/Revision Date: 05/2010
Participant's Initials:

## APPENDIX D: THE TRANSLATED VERSION OF THE ASSENT FORM

**استمارة توثيق موافقة الأشخاص في سن المراهقة**

**العنوان:** العلاقة بين مستوى الطلاقة باللغة العربية، مستوى الطلاقة باللغة الإنجليزية والتحصيل الأكاديمي العلمي لطلبة الصف الحادي عشر للناطقين باللغة العربية ويتعلمون الآن باللغة الإنجليزية

**الباحثة: شادية زملوط**

**ما الغرض من وجودي هنا؟**
هذه دراسة بحثية. وهي تشمل فقط الأشخاص الذي اختاروا المشاركة في الدراسة البحثية. لقد طلب منك المشاركة في هذه الدراسة لأن لغتك الأصلية هي اللغة العربية. نرجو منك التفكير بعض الوقت قبل اتخاذ قراركم. لا تتردد في توجيه أية أسئلة لي وخذ ما تشاء من الوقت من أجل مراجعة هذه الدراسة مع ذويك (الأب / الأم).

**لماذا يتم إجراء هذه الدراسة؟**
يتم إجراء هذه الدراسة لمعرفة إذا ما كان هناك أثر لطلاقة الطلبة في لغتهم الأصلية على تحصيلهم العلمي.

**ماذا سيحدث لي؟**
ستأخذ فحص تقييم الطلاقة باللغة العربية اسمه اختبار قدرات اللغة العربية (VAT) لتحديد مستوى طلاقتك باللغة العربية وسيحدد لك واحد من ثلاث مستويات: مبتدئ، متوسط، أو متقدم. سيستغرق الفحص سبعة عشر دقيقة فقط.

**كم من الوقت سأبقى في هذه الدراسة؟**
ستبقى في هذه الدراسة إلى حين أن تنتهي من الفحص و تعبئة استمارة فيها معلومات أساسية عنك و عن بلدك الأصلي، ومستواك الحالي في صفوف اللغة الإنجليزية للناطقين بغيرها. سيستغرق الفحص حوالي 17 دقيقة وسيستغرق تعبئة الاستمارة 5 دقائق أخرى.

**هل ستساعدني هذه الدراسة؟**
سوف تساعدك هذه الدراسة في فهم مدى التقدم الذي تحرزه أو الإخفاقات في مناهج العلوم.

**هل سيلحق بي أي ضرر؟**
لا يوجد هناك أي مخاطر متوقعة يمكن أن تنتج من أخذك اختبار قدرات اللغة العربية (VAT)

**هل يعلم أبواي (أبي أو أمي) أو الوصي بهذه الدراسة؟**
لقد تم تزويد أبواك / الوصي بالمعلومات عن هذه الدراسة. يمكنكم أن تتحدث معهم بهذا الشأن قبل أن تعطي قرارك.

**ماذا عن السرية؟**
المعلومات المتعلقة بك ستعامل بسرية تامة. سيتم تعيين رقم فحص لكل طالب و لن يعرف هذا الرقم سوى الباحثة. سيتم الحفاظ على خصوصية سجلاتك إلا إذا طلب منا بموجب القانون أن نكشف هذه المعلومات.

**ماذا لو كان لدي أية أسئلة؟**
إذا كانت لديكم أية أسئلة عن هذه الدراسة، فيمكنكم الإتصال بـ شادية زملوط على الرقم التالي 313-608-1978. إذا كانت لديكم أية أسئلة تتعلق بحقوقكم كمشاركين في بحث، فيمكنكم الاتصال برئيس لجنة الأبحاث البشرية على الرقم 313-577-1628.

**هل أنا ملزم بالمشاركة في هذه الدراسة؟**
إن المشاركة في هذه الدراسة ليس إلزاميا. يمكنكم أخذ فحص VAT. الرجاء مناقشة قراركم مع ذويكم ومع الباحثة. نود تذكيركم بأن هذا البحث قد يزود المعلمين، الطلبة، والأهل بالأمل فيما يتعلق بعامل ما قد يساعدكم في النجاح في المناهج الأكاديمية وبخاصة في مناهج العلوم.

**الموافقة على المشاركة في الدراسة**

إن توقيعكم أدناه يعني أنكم قد قرأتم المعلومات الواردة أعلاه عن الدراسة وأنه قد أتيحت لكم الفرصة لتطرحوا الأسئلة لمساعدتكم في فهم ماذا ستقوموا به جراء هذه الدراسة. إن توقيعكم يعني أنه قد تم إبلاغكم أنه يمكنكم تغيير قراركم في وقت لاحق والانسحاب من الدراسة إن رغبتم بذلك. كما أن توقيعكم على هذه الاستمارة لا يعني تخليكم عن أية حقوق قانونية. سيتم تزويدكم بنسخة من هذه الاستمارة.

| | |
|---|---|
| التاريخ | توقيع المشارك / المشاركة (13 سنة وما فوق) |
| | أكتب اسم المشارك / المشاركة بوضوح (13 سنة وما فوق) |
| التاريخ | ** توقيع الشاهد (حسب الحالة) |
| | أكتب اسم الشاهد بوضوح |
| التاريخ | توقيع الشخص الذي قام بشرح هذه الاستمارة |
| | اكتب بوضوح اسم الشخص الذي قام بشرح هذه الاستمارة |

** استخدم هذا الحقل إذا ما تم قراءة استمارة الموافقة للمشارك ( لكون المشارك مثلا أميا، مكفوفا حسب التعريف القانوني، أو تم ترجمة الاستمارة إلى لغة أجنبية)

تاريخ تسليم / ومراجعة الاستمارة:05/2010
الحرف الأول من الإسم و إسم العائلة للمشارك:

# APPENDIX E: VERSANT ARABIC TEST: SIDE 1 OF TEST PAPER

**Side 1 of the Test Paper:** Instructions and general introduction to test procedures. Note: These instructions are available in English and in Arabic.

VERSANT™

## VERSANT ARABIC TEST

REMINDER: The test begins when you say your name. If you hang up before you complete the test, the test cannot be graded. You cannot reuse the Test Identification Number.

**Test Identification Number**
**1234 5678**
Expires: September 29, 2009

**Call: 1.800.335.6393**

*Thank you for calling the Versant testing system.*
*Please enter your Test Identification Number on the telephone keypad.*
*Now, please say your name.*
*Now, please say the city and country you are calling from.*
*Now, please follow the instructions for Parts A through F.*

| PART | TASK | TEST DETAILS |
|---|---|---|
| A | Reading | *Please read the sentences as you are instructed.*<br>1. تُنظِّمُ المدرسةُ رحلاتٍ علميّةً باستمرار<br>2. هذا الأسبوع الرحلةُ إلى متحف العلوم<br>3. التلاميذُ متشوقون لهذه الرحلة لما فيها من فائدة علميّة<br>4. كان هناك شخص مختص يشرح للتلاميذ محتويات المتحف<br>5. سُكّانُ المُدُن الكبيرة في عجلةٍ دائمة<br>6. منهم من يمشي بسرعةٍ إلى العمل<br>7. ومنهم من يركب القطار السريع أو سيّارات الأجرة<br>8. والكثيرون منهم يعملون في أكثر من وظيفة |
| B | Repeat | *Please repeat each sentence that you hear.*<br>Example: a voice says, "الأعياد تساعد في التسلية والراحة"<br>and you say, "الأعياد تساعد في التسلية والراحة" |
| C | Questions | *Now, please just give a simple answer to the questions.*<br>Example: a voice says, "الطالب يدرس ماذا يفعل الاستاذ؟"<br>and you say, "يدرس" or "هو يدرس" |
| D | Sentence Builds | *Now, please rearrange the word groups into a sentence.*<br>Example: a voice says, "خارج البيت" ... "الأولاد" ... "يفضلون الأكل"<br>and you say, "الاولاد يفضلون الأكل خارج البيت" |
| E | Repeat | *Please repeat each sentence that you hear.*<br>Example: a voice says, "الأعياد تساعد في التسلية والراحة"<br>and you say, "الأعياد تساعد في التسلية والراحة" |
| F | Passage Retelling | *You will hear several brief passages in Arabic. After each passage, you will hear a beep and then you will have 30 seconds to retell it in Arabic as best you can. Try to retell as much of the passage as you can in Arabic, including the important details.* |

*Thank you for completing the test.*

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# APPENDIX F: THE VERSANT ARABIC TEST: SIDE 2 OF THE TEST PAPER

**Side 2 of the Test Paper:** Individualized test form (unique for each test taker) showing Test Identification Number, Part A: sentences to read, and examples for all sections.

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## TEST INSTRUCTIONS

### PLEASE READ THIS BEFORE TAKING THE TEST

Versant tests are automated spoken language tests that are taken on the telephone or computer. If you would like to listen to a sample test, purchase a practice test, or view the test score after taking the test (if applicable), please visit www.VersantTest.com

| PART | INSTRUCTIONS |
|---|---|
| **Before the Test** | • Carefully read this instruction page and the test paper. You may use a dictionary or ask someone for help if there are words or sentences that you don't understand.<br>• Choose a quiet location with a landline phone where you will not be interrupted during the test.<br>• Do not use a cordless phone, cellular phone, or VoIP phone (e.g., Skype™ or PC-to-phone services). Newer phones are generally better than older phones. Make sure that the phone is set to tone and not pulse. |
| **Beginning the Test** | • To begin the test, call the phone number on the test paper using a landline push-button telephone.<br>• A recorded examiner's voice will guide you through each section of the test.<br>• Enter your Test Identification Number using the telephone keypad when the examiner's voice asks you to do so. This number is printed on the top right of your test paper.<br>• The examiner's voice will then ask you two questions: your name, and the city and the country you are calling from. If you are speaking too loudly or too quietly, the examiner's voice will tell you.<br>• The test begins when you say your name. If you hang up before you complete the test, the test cannot be graded. You cannot reuse the Test Identification Number. |
| **During the Test** | • Hold the phone close to your mouth as shown in the picture below.<br>  <br>NO Too low, too far away — YES In front of mouth — YES A good distance<br>• Answer all questions smoothly and naturally in a clear, steady voice.<br>• If you don't know the proper way to respond to a test item, you can remain silent or say, "I don't know."<br>• Do not take notes or write during the test.<br>• When you hear, "Thank you for completing the test", you may hang up.<br>• If you wish, you may answer the optional questions at the end of the test. Your personal information will be kept anonymous. |

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# APPENDIX G: THE VERSANT ARABIC TEST: SIDE 1 SCORE REPORT

**Side 1 of the Score Report:** Summary of the test-taker's Overall score and subscores.

## SCORE REPORT

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Versant Arabic Test

Test Identification Number: 12345678
Test Completion Date: January 1, 2009
Test Completion Time: 1:23 PM (UTC)

| OVERALL SCORE |
|---|
| 48 |

| SKILL AREA | SCORE |
|---|---|
| Overall Score | 48 |
| Sentence Mastery | 53 |
| Vocabulary | 37 |
| Fluency | 44 |
| Pronunciation | 55 |


| | DESCRIPTION |
|---|---|
| Overall | The Overall Score of the test represents the ability to understand contemporary spoken Modern Standard Arabic (MSA) and speak it intelligibly at a native conversational pace on everyday topics. Scores are based on a weighted combination of four diagnostic sub-scores. Scores are reported in the range from 20 to 80. |
| Candidate's Capabilities | Test-taker can follow a native-paced conversation and produce utterances using a variety of words and structures. Pronunciation is generally intelligible; test-taker can express some composite information on familiar topics to a cooperative listener. |



For more information, visit us online at www.VersantTest.com

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# APPENDIX H: THE VERSANT ARABIC TEST: SIDE 2 OF SCORE REPORT

**Side 2 of the Score Report:** Detailed explanations of the test-taker's language capabilities.

## SCORE REPORT

VERSANT™

Test Identification Number: 12345678

EXPLANATION OF SUBSKILL SCORES

| SKILL AREA | UNDERSTANDING THE SKILLS | CURRENT CAPABILITIES |
|---|---|---|
| Sentence Mastery | Sentence Mastery reflects the ability to understand, recall and produce Arabic phrases and clauses in complete sentences. Performance depends on accurate syntactic processing and appropriate usage of words, phrases and clauses in meaningful sentence structures. | Test-taker can understand, recall and produce many Arabic phrases and clauses in sentence context. Test-taker produces a range of meaningful sentences. |
| Vocabulary | Vocabulary reflects the ability to understand common words spoken in sentence context and to produce such words as needed. Performance depends on familiarity with the form and meaning of common words and their use in connected speech. | Test-taker has a limited understanding of basic spoken Arabic words, even when they are used in clear, simple speech. |
| Fluency | Fluency reflects the rhythm, phrasing and timing evident in constructing, reading and repeating sentences. | Test-taker speaks with adequate rhythm, phrasing and pausing. Hesitations and possible repetitions or omissions of words may result in an irregular speech rate and some disconnected phrases. |
| Pronunciation | Pronunciation reflects the ability to produce consonants, vowels and stress in a native-like manner in sentence context. Performance depends on knowledge of the phonological structure of common words. | Test-taker produces most vowels and consonants in a clear manner, although an occasional word may be unclear. Stress is placed correctly in most words. Speech is generally intelligible. |



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## APPENDIX I: INDIVIDUAL STUDENT FORM

School code: _____
Research Code: _____
Age: _____ العمر Gender: الجنس Male____ Female_____
Grade Level: _____ الرتبة ESL Level: _____
Country of origin: _____بلد المنشأ
Number of years of formal schooling in native country in your native language: _____
عدد سنوات التعليم الرسمي في البلد الأصلي في اللغة الأصلية
Number of years in a U.S school: _____
عدد السنوات في المدرسة الامريكية
Grade level assigned when you enrolled in U.S school: _____
لرتبة عند تعيين المسجلين في المدارس الامريكية

**Please circle yes or no in the following questions**

**الرجاء دائرة بنعم او لا في الأسئلة التالية**

1. Is Arabic your native language? Yes or No
   اللغة العربية هي لغتك الأم؟ نعم أو لا

2. Is Arabic the primary language spoken at home? Yes or No
   اللغة العربية هي اللغة الأساسية المستخدمة في المنزل؟ نعم أو لا

3. Is your parent or guardian's native language Arabic? Yes or No
   هو أحد والديك أو ولي الأمر الأصلي باللغة العربية؟ نعم أو لا

4. Do your parents speak English? Yes or No
   يتكلمون الانكليزية والديك؟ نعم أو لا

5. Do you speak English? Yes or No
   هل تتحدث الانكليزية؟ نعم أو لا

6. Can you read well in your native language: Yes or No
   يمكنك أن تقرأ جيدا في لغتك الأم : نعم أو لا

7. Can you write well in your native language: Yes or No
   يمكنك كتابة بشكل جيد في لغتك الأم : نعم أو لا

8. Did you miss any years of formal schooling in your native country? Yes or No
   If yes, how many? _____

   هل يغيب عن أي سنة من التعليم المدرسي الرسمي في بلدك الأصلي؟ نعم أو لا
   إذا كانت الإجابة بنعم ، كم؟ _____

**DO NOT WRITE BELOW THIS LINE** **لا أكتب تحت هذا**

ESL Level: _____
ELPA Level: _____
Versant Score: _____
Grade Point Average (GPA):_____
MME Numerical Score: _____
MME Categorical Score: _____

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## ABSTRACT

**THE RELATIONSHIP BETWEEN ARABIC LANGUAGE PROFICIENCY, ENGLISH LANGUAGE PROFICIENCY, AND SCIENCE ACADEMIC ACHIEVEMENT OF 11TH GRADE ARABIC SPEAKING ENGLISH LANGUAGE LEARNERS**

by

**SHADIA ZAMLUT**

**December 2011**

**Advisor**: Dr. Navaz Bhavnagri

**Major**: Curriculum and Instruction

**Degree**: Doctor of Philosophy

Limited schooling in the first language (L1) has allowed English Language Learners (ELLs) to face obstacles in their second language (L2) and science courses. Therefore, this study examines these variables in the following two hypotheses: (1) there is a significant relationship between Arabic language proficiency and English language proficiency and (2) there is a significant relationship between Arabic language proficiency and science academic achievement. A causal-comparative design was used to examine these hypotheses. The investigator selected sixty 11th grade Arabic-speaking students based on a nonrandom sampling method from one high school in the Metropolitan Schools (pseudonym) in Southeast Michigan. The measures used to collect data include: (1) Versant Arabic Test (VAT), (2) English Language Proficiency Assessment (ELPA), and (3) Science component of the Michigan Merit Examination (MME). Descriptive analysis classified the sixty students by country of origin, age, gender and ESL level. Inferential statistics that were used to investigate the research hypotheses included correlational analysis and multivariate regression analysis. The results of correlational and multivariate regression analyses showed a significant relationship between Arabic language proficiency and

English language proficiency. Thus, the first hypothesis was supported. However, no significant relationship was found between Arabic language proficiency and science academic achievement, when conducting correlational and multiple regression analysis. Thus, the second hypothesis was not supported. Discussions are provided as to why the first hypothesis was supported and as to why the second hypothesis was not supported. Also, educational implications as well as directions for future research are provided.

# AUTOBIOGRAPHICAL STATEMENT

## EDUCATION

***Degrees***

**Ph.D.** 2011 Wayne State University, Detroit, MI

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Biology

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## EMPLOYMENT HISTORY

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**Instructor of ESL workshop (1 course)**

2007 to present Fordson High School, Dearborn, MI
**Instructor of Bilingual Biology (Grade 9)**

2005 to 2007 Universal American School of Dubai, Dubai, UAE
**Coordinator and Instructor of Bilingual/ ESL Program (Grades 7-12)**

2000 to 2005 Dearborn High School, Dearborn, MI
**Instructor of Bilingual English/ESL (Grades 9-12)**