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The academic preparedness of Latino students in dual language and transitional bilingual education programs

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ABSTRACT

This causal-comparative study analyzed the college readiness of Latino ELLs educated in two different bilingual education programs, Transitional Bilingual (TB) and Dual Language (DL), by examining science and mathematics scores on the nationally recognized college entrance exam, the ACT. A statistically significant difference was found in the performance of the participants in the areas of mathematics and science via a series of *t*-tests. The descriptive statistics report that DL participants had a 29.6% higher probability in science and a 15.2% higher probability in mathematics of being college ready, per the Texas Uniform Admission Policy. Over all, DL participants outperformed TB participants.

KEYWORDS

dual language education; transitional bilingual education; English language learners (ELLs); college readiness; bilingual education programs; native language instruction

English language learners (ELLs) have become a significant part of the United States, contributing to the country's diversity. In the last three decades, the number of speakers of languages other than English has grown from 23 million to more than 60 million across the nation (Gándara, 2015). As the number of individuals who speak a language other than English continues to grow, so does the population of school-aged children labeled as ELLs in the nation's school systems. The U.S. Census Bureau (2013) reports that 9.2%, or 4.4 million, of the school-aged population receives bilingual education services (cited in Ruiz Soto, Hooker, & Batalava, 2015), with Spanish among the top three languages used as a means of instruction (Ruiz Soto et al., 2015; Varghese & Park, 2010). Texas, where this study took place, is among the states within the nation with the highest concentrations of ELL students (Ruiz Soto et al., 2015); 840,724 were reported in 2013—the majority of whom are Spanish speakers (Brown & Lopez, 2013; Ruiz Soto et al., 2015; Texas Education Agency, 2014). Currently, 25.7% of the nation's Hispanic population resides in Texas, second only to California's 37.7% (Brown & Lopez, 2013).

The ELL and bilingual education

ELL students receive bilingual education services, with native language support at varying degrees, depending on state guidelines and district bilingual program implementations. However, regardless of the type of bilingual education program received, each is supposed to prepare the ELL academically for success in the K–12 system and beyond, providing the student with the opportunity to learn content while still addressing the ELL's unique linguistic needs. Yet, when reviewing the academic success of Latinos in higher education, a concern comes to light—they are underrepresented, making up only 11% of all college students (Zell, 2010).

With such a large population of ELL students within the US, the question as to why Latino students are not enrolling in college arises. Surely, factors such as guidance from high school counselors, cost of tuition, or even family support are factors that may contribute to the low percent

of the Latino population enrolled and completing college (Coy-Ogan, 2009). However, one other area that undoubtedly influences the likelihood of a student attending college is their overall academic preparation, which for many ELLs directly involves the type of bilingual education services they received while enrolled in the K–12 system (Coy-Ogan, 2009; Parker, Segovia, & Tap, 2016; Zell, 2010). According to Thomas and Collier (2003), the type of bilingual education program received at the elementary level directly affects the ELL’s academic success later on in his or her academic career. The types of bilingual education programs used to educate ELLs vary greatly from state to state and fall into one of two distinctive classes—additive or subtractive—each using the ELL’s native language to varying degrees (Baker, 2011).

Additive v. subtractive bilingual education programs

The level of native language (L1) support provided to ELLs is ultimately determined by the particular bilingual education program being offered to the student. While “bilingual education program” is a term used to describe many programs, there are defining characteristics that make each unique. According to Crawford (2007), the length of program implementation and the amount of time the students’ L1 is used for instruction are among the characteristics which set one program apart from another. Ultimately, bilingual education programs are placed into one of two subcategories: (1) *additive*, fostering the native language; or (2) *subtractive*, excluding the native language (Adamson, 2005; Baker, 2011; Lindholm-Leary, 2012; Soltero, 2004).

Subtractive bilingual education programs offer limited L1 support. On average, within three to five years, subtractive programs withdraw the use of the L1 during formal instruction, leaving ELLs in classroom settings with no linguistic support (Adamson, 2005; Baker, 2011; Ramirez, Yuen, & Ramey, 1991). Subtractive bilingual education programs fail to provide an ideal language learning environment for ELLs and strive for the ELLs’ acquisition of the English language (L2) (Baker, 2011). Transitional bilingual education is the most commonly used subtractive program in the United States, even though it offers limited opportunities for academic growth when compared to other bilingual education programs (Baker, 2011; Gersten & Woodward, 1995; Gómez, Freeman, & Freeman, 2005; Hofstetter, 2004; Ramirez et al., 1991; Thomas & Collier, 1997, 2002).

Additive bilingual education programs are also available to students. These programs support the continuous development of the ELL’s native language while simultaneously developing English language skills (Adamson, 2005; Baker, 2011; DeJesus, 2008; Estrada, Gómez, & Ruiz-Escalante, 2009; Gravelle, 1996). Additive programs have slowly gained popularity because they do not place ELLs at risk of losing their native language, but provide the opportunity to acquire a second. Furthermore, additive bilingual education programs have been noted to offer: (1) access to an academically challenging program; (2) the continuous development of the L1 and L2 in a supportive environment; and (3) opportunity for those enrolled to develop into bilingual and bicultural individuals who identify with the majority/minority groups (Baker, 2011; DeJesus, 2008; Estrada et al., 2009; Gándara, 2015; Gómez et al., 2005; Varghese & Park, 2010). The use of developmental programs, like dual language, have slowly continued to grow in popularity, creating a shift in instructional methods. The Center of Applied Linguistics (2016) recently reported a total of 458 DLE programs nationwide with numbers that continue to grow.

Additive bilingual education advocates suggest that bilingualism provides: (1) greater mental flexibility; (2) superiority in concept formation; (3) enhanced executive function of the brain, resulting in better focus and attention; (4) enhanced problem-solving skills; and (5) higher levels of academic performance (Adamson, 2005; Baker, 2011; Freeman, 2007; Gándara, 2015; Lindholm-Leary, 2012; Thomas & Collier, 1997, 2002, 2003; Varghese & Park, 2010). Spanish-speaking Latinos, who Martinez, Cortez, and Saenz (2013) claim have been marginalized within the school system because of their Spanish language, now have an opportunity to experience academic success via dual language programs.

Dual language (DL) programs are mostly implemented at the elementary level; however, at the secondary level, DL programs are becoming more common because of the success students experience (Lindholm-Leary, 2012). ELLs enrolled in high school DLE programs are more likely to enroll in higher-level math courses, are more likely to pass their high school exit exams, and less likely to drop out of school than their English mainstream peers—offering them preparation for college, and thus providing an opportunity to raise the nation’s low percentage of Latino students pursuing higher education (Gándara, 2015; Lindholm-Leary, 2012; Zell, 2010).

College readiness and the ELL

The success of the ELL college student has sparked an interest with researchers in the field of higher education. In reviewing previous research on college readiness, student success, and the ELL, it was found that studies focusing on (1) learning how to appropriately serve minority students (Moje, 2006; Serra Hagedorn, 2004; Vigil Laden, 2004); (2) creating resources for language minority students (Merisotis & Goulian, 2004); and (3) preparing university faculty to serve multilingual students (Hansfield, 2006; Nilles, Alvarez, & Rios, 2006) have all been conducted. However, even with the available data, little research exists specifically for Hispanic ELLs and their levels of academic college readiness, based on the type of bilingual education program in which they were educated.

The low success rate of the Latino college-going subgroup has made the preparation of ELLs a particular area of concern and suggests a need for more research focused on the factors that may influence Latino ELLs and their opportunities for success in college (Perrakis & Hagedorn, 2010). This study attempted to fill in the gap of research by examining the college preparedness of Latino ELL students educated through two different bilingual education programs: transitional bilingual and dual language.

Method

The purpose of this causal-comparative study was to track, compare, and analyze the college readiness of two cohorts of English language learners (ELLs), each educated in a different bilingual education program with varied amounts of native language (L1) support in the classroom, by examining reading and mathematics scores on the nationally recognized college entrance exam, the American College Test (ACT) (American College Test, 2011). One cohort was enrolled in the early-exit transitional bilingual (TB) education program from 1996–2001, while the other cohort was enrolled in the two-way dual language (DL) education program from 1996–2011. Both cohorts enrolled in the same South Texas school district. The research question that guided the study was: Is there a statistically significant difference between the American College Test (ACT) college entrance exams of ELLs educated through a TB program and a DL program in the areas of mathematics and science?

The statistics were computed for the composite scores of the ACT as well as the mathematics and science sections. The measurements of central tendency, mode, mean (M), and range of score were calculated, as well as the standard deviation (SD). The inferential statistics computed were a series of t -tests to determine whether the difference between the two comparison groups was statistically significant, with the significance level set at $p < .05$ prior to running any analyses. In addition to the series of t -tests, the effect size was also calculated to determine to what degree the statistical information derived from the t -tests could be generalized to other populations (Gay, Mills, & Airasian, 2012; Johnson & Christensen, 2008).

Population

The first comparison group participating in this study was enrolled in a 50:50 two-way DL enrichment model at the elementary level and an 80:20 DL maintenance model at the secondary level. Those who received instruction in the 50:50 program received half of their instruction in their native language,

Spanish, and the other half of their instruction in the target language, English, through content area instruction at the elementary level. At the secondary level, the students were part of an 80:20 maintenance model where they received 80% of their instruction in English and 20% of their instruction in Spanish.

The second comparison group participated in a TB program in elementary school. This program was early-exit, delivering instruction to the ELLs partially in their L1 for only a period of three to five years before exiting students from the program and placing them in an all-English setting for the remainder of their elementary through high school careers.

Participant selection

The participants in this study were selected based on the following criteria: (1) initial enrollment as a TBE student in pre-kindergarten between 1996–1998; (2) initial enrollment into the DLE program in pre-kindergarten, kindergarten, or first grade between 1996–1998; (3) TBE students with a native language of Spanish; (4) DLE students with either English or Spanish as a native language; (5) graduation dates in 2009–2011 as a high school senior with continuous enrollment in the district.

Based on the criteria, 407 TBE and 146 DLE students were identified as potential participants. In order to create comparable sample (*n*) groups, stratified sampling was used on the TBE comparison group (Gay et al., 2012). The potential participants were placed in alphabetical order, selecting every third on the list. One hundred thirty-four potential participants on the TBE list were selected to participate in this study. A survey was created, piloted, and then sent out to the potential participants.

The surveys were designed to gather information on the ELL's post-high-school academic careers, including information on universities or colleges attended and any testing completed in order to enter college. The survey was made available in paper form as well as online to reach a wider audience (Cox & Cox, 2008; Fink, 2006). Follow-ups were conducted via telephone; during these calls, demographic and academic information was gathered for those students who did not submit their information through the mail or online survey. A total of 28 TB students and 27 DL students opted to participate in the study. These 55 individuals became the sample (*n*) representing the population (*N*). Although the sample size is low, Gay et al. (2012) note that, with a minimum of 25–30 participants, one can run statistical analyses.

Instrument

The instrument used in this study was the American College Test (ACT). The ACT is a nationally recognized college admissions exam accepted by universities in the United States (American College Test, 2016). The ACT consists of content area exams in English, mathematics, reading, and science. However, for the purpose of this study, the mathematics and science sections will be explained in detail. The 60-question, multiple-choice test consists of questions that are geared to assess the mathematical skills an average student would acquire by the eleventh grade (American College Test, 2012). The 35-minute science portion of the exam, which consists of 40 questions, is designed to assess the student's mastery of the following scientific skills: (1) analysis; (2) evaluation; (3) observation; (4) reasoning; and (5) problem solving (American College Test, 2012). The exam has been proven valid and reliable (American College Test, 2011; Springer, 2010).

Results

In exploring the level of statistical significance between the performance of ELLs educated through the TB and DL program on the mathematics and science portions of the ACT college entrance exam, a statistically significant difference was found in both mathematics ($p > .002$) and science ($p > .000$).

Composite scores

While the state of Texas does make recommendations to four-year institutions on recommended scores for math and science under the Texas Uniform Admission Policy (TUAP), which sets the scores on various college entrance exams for universities across the state to gauge college readiness in its incoming freshman (Texas Education Code § 51.803, 2011), a set composite score is not suggested. In reviewing select Texas universities within 300 miles of South Texas, it become evident that each university had varying composite score requirements that needed to be met in order to enter their respective universities as freshman. The lowest score noted among the nine universities reviewed was an 18. This score was used as the set measure to gauge the participants’ college readiness (see Table 1).

The composite scores received by each student reflect the average of the individual scores received on the subsections of the ACT exam (American College Test, 2012). In reviewing the descriptive statistics, the DL comparison group had a higher percentage of participants, 59.3%, meet the set standard score of 18 and deemed as college-ready under the Texas Uniform Admissions Policy (Texas Education Code § 51.803, 2011). The TB comparison group only had 28.6% meet this requirement (see Table 2). Using the composite scores as a predictor of college readiness, it can be concluded that of the two comparison groups, the DL participants have a higher probability to enroll and sustain themselves academically in college-level courses.

Mathematics

The next set of data analyzed from the ACT were the participants’ scores on the mathematics subsection of the exam. In reviewing the descriptive statistics for mathematics, it was found that the

Table 1. Overview: ACT Performance by Bilingual Education Program.

		Composite		Math		Science	
		TB	DL	TB	DL	TB	DL
N	Valid	28	27	28	27	28	27
	Missing	27	28	27	28	27	28
Mean		15.32	20.63	16.61	19.67	15.21	20.85
Median		15.00	20.00	16.00	18.00	15.00	20.00
Mode		15	17	16	16	18	20
Std. Deviation		3.356	4.869	2.713	4.169	4.175	4.769
Range		13	16	10	14	14	22
Minimum		10	14	13	15	9	13
Maximum		23	30	23	29	23	35

Table 2. Frequency Distribution: ACT Composite Scores by Bilingual Education Program.

Score (X)	TB		DL		
	Frequency (f)	Percentage (%)	Score (X)	Frequency (f)	Percentage (%)
10	1	3.6	14	2	7.4
11	2	7.1	15	2	7.4
12	3	10.7	16	3	11.1
13	4	14.3	17	4	14.8
14	2	7.1	19	1	3.7
15	6	21.4	20	2	7.4
17	2	7.1	21	1	3.7
18	3	10.7	22	3	11.1
19	2	7.1	24	3	11.1
20	1	3.6	25	1	3.7
22	1	3.6	26	2	7.4
23	1	3.6	29	2	7.4
			30	1	3.7
	n = 28	100.00%		n = 27	100.00%

Table 3. Frequency Distribution: ACT Mathematics Scores by Bilingual Education Program.

TB			DL		
Score (<i>X</i>)	Frequency (<i>f</i>)	Percentage (%)	Score (<i>X</i>)	Frequency (<i>f</i>)	Percentage (%)
13	2	7.1	15	1	3.7
14	2	7.1	16	6	22.2
15	6	21.4	17	4	14.8
16	10	35.7	18	3	11.1
17	1	3.6	19	4	14.8
18	2	7.1	21	2	7.4
19	1	3.6	22	1	3.7
21	1	3.6	23	1	3.7
22	1	3.6	24	1	3.7
23	2	7.1	25	1	3.7
			28	1	3.7
			29	2	7.4
<i>n</i> = 28			<i>n</i> = 27		
100.00%			100.00%		

DL group performed at a higher level than the TB group, with 25.9% meeting the recommended score of 22 under the Texas Uniform Admission Policy (TUAP) and deemed as college-ready (Texas Education Code § 51.803, 2011). The TB did poorer, with only 10.7% meeting the recommend TUAP score (see Table 3).

Inferential statistics were run for the mathematics portion of the ACT exam in the form of a *t*-test (see Table 4). Given the results of the Levene’s test for homogeneity of variances, $F(1,53) = 5.369$, $p = 0.024$, a *t*-test not assuming homogeneous variances was calculated. The results indicate a significant difference between the two groups, $t(53) = -3.213$, $p = 0.002$, suggesting that the DL group ($M = 19.67$; $SD = 4.169$) has a higher probability of being successful in mathematics courses taken in a university setting than those from a TB program ($M = 16.61$; $SD = 4.169$). The reported effect size was weak, $R\text{-squared} = 0.11$.

Science

The participants’ science performance was also analyzed. Under the TUAP outlined in the Texas Education Code § 51.803 (2011), the recommended score for science is a 24. In reviewing the group frequency distribution of scores in Table 5, it was noted that no one in the TB group performed at the recommended score of 24. However, the DL group had 29.6% meet the recommended score outlined in the TUAP, making them three times more likely to not only meet the recommended score to enter college, but also be academically prepared to enroll and sustain themselves in college-level science courses.

A *t*-test was also conducted to compare the effect of the TB and DL bilingual education programs on the academic performance of the participants on the ACT science portion (see Table 6). An equality of variance within the groups was assumed, $F(1,53) = -4.641$, $p = 0.884$. The results of the *t*-test indicate a significant difference between the two groups, $t(53) = -4.641$, $p = 0.000$, suggesting,

Table 4. *t*-Test: Mathematics ACT Scores.

	Levene’s Test for Equality of Variances		<i>t</i> -Test for Equality of Means						
	F	Sig.	t	df	Sig. 2-tailed	Mean Diff.	Std. Error Diff.	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	5.369	.024	-3.237	53	.002	-3.060	.945	-4.955	-1.164
Equal variances not assumed			-3.213	44.428	.002	-3.060	.952	-4.978	-1.141

$p < .05$.

Table 5. Frequency Distribution: ACT Science Scores by Bilingual Education Program.

Score (X)	TB		DL		
	Frequency (f)	Percentage (%)	Score (X)	Frequency (f)	Percentage (%)
9	2	7.1	13	3	11.1
10	2	7.1	17	3	11.1
11	2	7.1	18	3	11.1
12	2	7.1	19	1	3.7
13	4	14.3	20	4	14.8
14	1	3.6	21	1	3.7
15	3	10.7	22	2	7.4
16	1	3.6	23	2	7.4
17	1	3.6	24	3	11.1
18	5	17.9	25	3	11.1
19	1	3.6	27	1	3.7
20	1	3.6	35	1	3.7
23	3	10.7			
	n = 28	100.00%		n = 27	100.00%

Table 6. t-Test: Science ACT Scores.

	Levene's Test for Equality of Variances		t-Test for Equality of Means						
	F	Sig.	t	df	Sig. 2-tailed	Mean Diff.	Std. Error Diff.	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	.022	.884	-4.641	53	.000	-5.722	1.233	-8.195	-3.249
Equal variances not assumed			-4.630	51.709	.000	-5.722	1.236	-8.202	-3.242

$p < .05$.

as in math, that the DL ($M = 20.85$; $SD = 4.769$) group has a higher probability of being successful in college-level science courses than those in the TB ($M = 15.21$; $SD = 4.175$) program. The calculated effect size was moderate, R -squared = 0.29.

Conclusion

Genesee, Lindholm-Leary, Saunders, and Christian (2005) reported that the longer ELLs are educated through a bilingual program that fosters the development of the L1, the greater the academic benefits. More so, Thomas and Collier (2002) note that the effects of a dual language education program are not seen at the elementary level, but at the secondary. This study furthers and supports both claims. In reviewing the academic performance of these Latino ELLs educated through either a DL or TB education program, it was concluded that students educated through the DL education program are academically better prepared with a higher probability of sustaining themselves academically once enrolled in a university setting. This results of this study bring to light the positive effects that native language instruction can have on a student's academic achievement (Baker, 2011; Gómez et al., 2005; Thomas & Collier, 1997, 2002). In the dual language model used with these particular participants, all science instruction was delivered in the Spanish language. Even though the ACT science portion of the exam was delivered in English, the DL students still performed higher than the TB students who received their formal instruction for science in English through the course of their academic career in the district. In the area of mathematics, the DL students also performed at a higher level than the TB students. Students in the DL program received their instruction in English, thus proving that instruction in the two languages does not cause confusion or academic delay, as once believed (Baker, 2011).

While the reported effect sizes for these statistical findings ranged between weak and moderate, thus limiting the ability to generalize these findings to other groups, it is important to mention that the small number of participants for this study may have accounted for low effect sizes. Dual language programs carried out through the twelfth grade are not common. However, as the number of DL programs continues to grow and their implementation spreads beyond the elementary level, to secondary schools as well, students continue to graduate from DL programs; in the future, the study may be replicated with more participants. Nonetheless, the findings of this study should not be discounted. On the contrary, they serve as a starting point to begin conversations about the most effective programs available to ELL students that will not only prepare them academically for their careers in public education, but help them have successful careers in college, while also raising the graduation rates for the Latino population, which recently was at only 6% (Perrakis & Hagedorn, 2010).

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