Effectiveness of a Summer Bridge Program at McLennan Community College

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ABSTRACT

In this quantitative research study, student performance data were collected from 2014–2016 summer bridge program participants to examine the relationship between participation in the MCC summer bridge program and selected student outcomes by comparison to a matched group of students who did not participate in the program. The research questions addressed in this study were as follows: To what extent did participation in a summer bridge program improve participants' TSI scores? To what extent was participation in a summer bridge program related to DE placement results? To what extent did the average number of credit hours accumulated differ between students who participated in a summer bridge program and those in a comparison group that did not? The results from the three research questions revealed that students who participated in the MCC summer bridge program experienced some success in select outcomes, although other outcomes still need to be improved to increase student achievement in all objectives.

After graduation, high school seniors face difficult decisions concerning their postsecondary education. Postsecondary education occurs after high school, including enrollment in four-year universities, two-year higher-education institutions, or trade schools. The importance of obtaining a college education is evident in the projected difference in income between individuals who hold a high school diploma and those who hold a postsecondary degree (Baum & Payea, 2013). However, being underprepared for the rigors of college-level work is a barrier that many students must overcome before they even begin college courses. Students considered underprepared typically do not have the academic and affective skills needed to succeed in college-level courses. Affective skills are those needed for students to control their emotions during the learning process (Vermunt, 1996). The gap in preparedness between secondary and postsecondary education causes approximately 40% of graduating seniors who enter college to require DE courses before starting college-level courses (Adams, 2012), and the number of students who enter postsecondary education requiring DE is a challenge for both two- and four-year institutions of higher education (Pretlow & Wathington, 2012). According to ACT (2015), students not considered college ready at the beginning of their freshman year are less likely to succeed in reaching their educational goals by comparison to those who are. Researchers at a California institute found that approximately 72% of students identified as college ready graduated, while only approximately 39% of students deemed underprepared did so (Allen & Bir, 2012). The attrition rate among students deemed as underprepared is a driving force that has led two- and

four-year universities to create summer bridge programs to increase the academic and affective skills students need to be successful in college. These programs focus on decreasing the length of students' DE course sequences and increasing academic preparedness and the affective skills needed to be successful at the college level. The components of summer bridge programs vary across institutions in length, focus, and structure; however, one commonality is that all are designed to help underprepared students achieve their postsecondary goals.

Statement of Purpose and Research Questions

In this non-experimental, secondary data analysis, descriptive study, the researchers sought to examine the relationship between participation in the McLennan Community College (MCC) summer bridge program and participants' TSI (Texas Success Initiative) test scores, DE placement, and the average number of accumulated MCC college-level credit hours received. The independent variable was participation in the eight-day summer program offered at the campus. The dependent variables included the students' TSI scores, DE placement, and the number of college-level credit hours accumulated at MCC. The TSI test is an instrument legislated in Texas to measure college readiness. The research questions for this study were as follows:

1. To what extent did participation in a summer bridge program improve participants' TSI scores?

2. To what extent was participation in a summer bridge program related to DE placement results?

3. To what extent did the average number of credit hours accumulated differ between students who participated in a summer bridge program and those in a comparison group that did not?

Description of MCC's Summer Bridge Program

MCC redesigned its DE program and added a summer bridge program. In 2014, MCC implemented the redesigned eight-day DE summer bridge program as an option for students whose TSI test scores indicated that they needed DE courses. Students were recruited through the MCC test center and local school counselors, both of which identify potential student participants based on TSI scores and student interest. The goal of the summer bridge program was to enable students to acquire the academic and affective skills needed to increase their TSI scores, and the academic skills essential to complete college-level coursework successfully. During the summer bridge program, students completed academic tutorials in math, reading, and writing; discussed emotional intelligence; learned test preparation and testing strategies; and received advising and college preparation. The summer bridge program contained a one-hour orientation, three hours of assessments in PLATO Version 1.0.41, a one-hour emotional intelligence session, seven hours of test-taking strategies and test preparation, a one-hour college preparation seminar, fifteen hours of academic tutorials, three hours to retake the TSI, and one hour of academic advising. PLATO is a computer-based instructional program that creates an individualized curriculum based upon students' performance on an initial placement test. The individualized learning program created by PLATO breaks math, reading, and writing into units and sub-units that the student needs to master to reach college-level readiness. The program includes pretests, lessons, practice problems, and unit tests. On the last day of the summer bridge program, students took the TSI again to see whether their scores increased or decreased, and the effect their new scores had on course placement. If students achieved a college-ready TSI score, they were able to begin their freshman year in college-level courses. Although academic sessions were tailored to meet each student's individualized needs, several components were designed to allow administrators to take a broad approach and offered generalized support where needed.

Theoretical Framework

The theoretical framework for this study was Tinto's (1988) Model of Student Departure, which was based on Van Gennep and Caffee's (1960) "rite of passage" model that addressed the process individuals undergo when they move from one community or group into a new one. According to Tinto (2006), Van Gennep and Caffee's study suggested that individuals go through three stages during this period: separation, transition, and incorporation (Tinto, 1988). Tinto applied these three stages of Van Gennep and Caffee's model to those stages that students experience when moving from secondary to postsecondary education, and used them to help explain why students leave college before completing their degrees. Each stage poses unique challenges to students' retention, and the strategies to increase retention at each stage have led to the creation of different program interventions. Tinto's model reflects the three stages above. He discussed each stage separately and offered postsecondary institutions programming ideas that could help decrease student departure during each stage.

Summer bridge programs take place during a short time in a student's life and normally are unable to help students through all three stages in Tinto's model. However, several summer bridge programs indicate that they use Tinto's model of student departure to determine the structure of the program and which components they will offer to help students negotiate the separation and transition stages that occur prior to incorporation in the educational institution (Castleman, Arnold, & Wartman, 2012; Maggio, White, Molstad, & Kher, 2005; Slade, Eatmon, Staley, & Dixon, 2015).

Review of Literature

The growing number of students in DE entering postsecondary education has made it essential for institutions to implement programs designed to decrease the number of such students. Several studies have indicated that low retention and graduation rates for students in DE or high-risk student populations are important reasons to implement such programs (Buck, 1985; Meyers & Drevlow, 1982; Slade et al., 2015). Because of the dismal numbers of students in DE who graduate, two and four-year colleges around the country have implemented summer bridge programs as a potential solution to the rising attrition and low graduation rates.

The study of summer bridge programs can be traced back to Myers and Drevlow's (1982) and Buck's (1985) studies, in which low-income and minority students received an intensive four-week residential summer program designed to increase their academic and affective skills. The results of these studies showed that students who participated in the program had increased retention rates by comparison to four other student populations with similar demographics (Meyers

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& Drevlow, 1982). These two studies helped create the foundational body of research on the effects summer bridge programs have on students' academic and affective skills. Since then, the number of studies of summer bridge programs has grown, and the variability in the format of such programs has increased.

Several researchers have presented data on multiple summer bridge programs to determine their influence on retention and other measures of student success (Kallison & Stader, 2012; Maggio et al., 2005). Maggio et al. (2005) collected data from six institutions that followed 397 bridge participants for three years. The program components varied from one institution to another and allowed the researchers to compare them to determine the effect that each had on student retention and college grade point average (GPA). The optimal length of a successful summer bridge program is one factor that institutions must consider when establishing such a program. Maggio et al. (2005) compared the retention rates and GPAs of six summer bridge programs that varied in length from 4–7 weeks. Results from their study indicated that the longer the program, the lower the students' GPAs (Maggio et al., 2005). The authors also found that class size had a negative effect on GPA, although peer tutoring had a positive effect. The negative relationship between the length of the program and students' GPAs is counterintuitive and requires additional data to determine the cause of these results. However, the results that showed the positive effects of peer tutoring are consistent with Tinto's (1988) Model of Student Departure, which highlights the importance of students building a relationship with the institution to foster a sense of belonging.

In 2007, Kallison and Stader (2012) conducted a study on 14 pre-freshman summer bridge programs in Texas institutions. Community colleges implemented seven of the programs while a four-year university implemented the other seven; 12 summer bridge programs were located on college campuses and the other two were housed at high school campuses. All programs included classroom instruction, but several used computers for most of the instruction or utilized supplementary computer-based instruction. Kallison and Stader (2012) found that all 14 summer bridge programs took a holistic approach by providing both academic and affective skills components. The study lacked the key information necessary to determine student growth, but the researchers did find that students at two of the community colleges increased their placement test scores by the end of the program. The researchers could not determine which components affected students' increased test scores directly, but the researchers compared program components between the two institutions that experienced growth to determine the ways in which a holistic approach to a summer bridge program that includes advising, tutoring outside of the class, and other support services may have affected student success.

The work of Tinto and other theorists guided North Carolina A&T State University officials during the development of their summer bridge program. Institution administrators wanted to address three specific areas of student growth: academic engagement, affective skills, and exposure to what it is like to be a college student (Slade et al., 2015). Grant funding for this program also affected its components and structure. The six-week residential program was required to offer credit-bearing courses to continue to receive federal funding (Slade et al., 2015). They offered students who participated in the program college-level math and English, and participants received college credit for their coursework. The institution administrators placed heavy emphasis on classroom instruction and lab tutoring. Tinto (2006) discussed the importance of innovative classroom techniques as a strategy to increase student engagement. The institution administrators implemented a flipped-classroom approach in which students were required to read outside of the classroom and complete activities in class based on those readings (Slade et al., 2015). The program administrators strived to implement such innovative teaching techniques to increase student engagement and accountability (Slade et al., 2015). The program increased retention among first-year, high-risk students, and 93% of participants in the 2011 summer bridge cohort, and 94% in the 2014 summer bridge cohort achieved good academic standing at the college (Slade et al., 2015).

The creation of a holistic DE summer bridge program that improves select student outcomes can be challenging for higher education institutions. For example, Strayhorn (2011) set out to determine if participation in a summer bridge program affected students' level of academic self-efficacy and their sense of belonging. Strayhorn (2011) found that students' academic skills and self-efficacy improved, but their social skills and sense of belonging did not, although these were two main competencies the institution was trying to increase based upon the components they implemented in the program (Strayhorn, 2011). These results indicate the challenges associated with fostering students' integration into campus life, even when an institution attempts explicitly to implement a holistic summer bridge program.

Although some studies failed to yield statistically significant effects in certain areas of interest, such as GPA, math and English grades, social skills, or the students' sense of belonging (Barnett, Bork, Mayer, Pretlow, Wathington, & Weiss, 2012; Johnson-Weeks & Superville, 2014; Wathington, Pretlow, & Mitchell, 2011), others supported the effectiveness of summer bridge programs by yielding higher GPA and retention rates (Bir & Myrick, 2015; Walpole, Simmerman, Mack, Mills, Scales, & Albino, 2008). The way in which data are interpreted can affect whether the study appears to support the use of summer bridge programs. For example, in Johnson-Weeks and Superville's (2014) study, there were no statistically significant differences in GPAs

or math and English grades between the control group and those who participated in the summer bridge program. However, the GPAs of students in the bridge program were comparable to those of students who were not required to take DE courses (Johnson-Weeks & Superville, 2014); this suggests that the program may have increased bridge students' abilities to be as successful as those who were not required to take such courses. Some researchers have focused on retention rates, and several studies demonstrated that students who participated in summer bridge programs had higher retention rates than those who did not (Bir & Myrick, 2015; Slade et al., 2015; Walpole et al., 2008).

The study of summer bridge programs has increased in the past decade and has created a body of research that can help institutions understand the successes and failures experienced by previous institutions that have implemented such programs. Because each program contains components and has a structure designed to serve the institution's target student population, researchers should consider the differences in these populations, as they may influence the results obtained. Although the literature revealed mixed results among the studies analyzed, available research has still demonstrated clear evidence that summer bridge programs do increase the skills that students in DE need to succeed in college courses.

Research Design

This study adopted a quantitative, non-experimental, retrospective, descriptive research design. As described by Johnson and Christensen (2010), a non-experimental study is one in which the researcher does not manipulate the independent variable. The independent variable in this study that was applied to all three research questions was participation in the summer bridge program. This study qualified as a secondary data analysis because the researcher used archived data from summer bridge students who participated in the program from 2014 through 2016. Because the data were derived from several periods in the past, the study qualified as a retrospective study. Lastly, the study was considered descriptive because such a study is one that depicts a situation or phenomenon (Johnson & Christensen, 2010). In this study, the situation described included students' participation in the summer bridge program and an examination of the relationship between participation in the MCC summer bridge program and elected student outcomes. A comparison group with student characteristics—including demographics and TSI scores similar to those of the summer bridge program participants—was selected to determine to what extent there was a statistically significant

difference in the average number of college-level credit hours the two groups received.

Participants and Sampling Procedures

This non-probabilistic study used criterion-based sampling to select the participants. Johnson and Christensen (2010) indicated that criterion-based sampling is most appropriate when a researcher selects a sample based on specific characteristics desired. The researcher then selects participants in the population that match the characteristics desired (Johnson & Christensen, 2010). The criterion-based sample in this study consisted of all students who participated in and completed the MCC summer bridge program between the 2014 and 2016 timef rame. The reason that only students who participated in and completed the summer bridge program were included was because if they did not complete the program, the researchers could not examine the relationship between participation in the MCC summer bridge program and outcomes of interest. Participants chose to enroll in the MCC summer bridge program after being invited to participate by MCC advisors who identified them based on interest and TSI scores. The 2014–2016 period was chosen because it included all summer bridge program sessions completed up to the time of this study, and data from programs that were offered after 2016 were not yet available for analysis. The 2014–2016 time frame was analyzed aggregately because the sample size was too small to analyze each year individually. Approximately 30 students participated in the summer bridge program across all years. Demographic data were collected, including the participants' gender, ethnicity, first-generation status, and socioeconomic status.

Out of the 30 participants, 21 were female (70%), and nine were male (30%). In terms of students' ethnicity, 12 were White, 17 Hispanic, and one classified as two or more races. No African American students completed this program. Several students enrolled but did not finish the program. The African American population is likely to be over represented in DE, but did not have any participants in this study. In terms of age, 23 participants were under the age of 21 and seven participants were over 21 years old. Eighteen of the 30 students qualified for Pell Grants (60%), which suggests these students had a low socioeconomic status. Nineteen were first-time students in college (63%).

The comparison group includes nine males (30%) and 21 females (70%). Twelve students (40%) were over the age of 21, and 18 (60%) were under 21. The researcher grouped students as under 21 or over 21 because the National Center for Education Statistics

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made a point that any student older than 21 who was considered either a freshman or sophomore in college could be considered non-traditional because they are older than the age of someone who entered college fresh out of high school (Aud, et al., 2012). All students were first-time in college and 19 (63%) Pell Grant eligible. The demographic characteristics of both groups were then compared on demographic characteristics to ensure no systematic differences existed prior to the intervention. Chi-square tests were used to compare categorical variables including gender, age, and Pell Grant status. Minimum expected frequencies for all levels of the categorical variable were examined and determined to be sufficient prior to conducting all chi-square tests. An independent samples t-test was used to compare groups on the interval level variable of TSI scores. The results indicated no statistically significant differences in gender ($\chi 2 = 0.000$, $p < 1.00$), age ($\chi 2 = 1.93$, $p < 0.17$), or Pell Grant status ($\chi 2 = 0.71$, $p < 0.79$). There were also no statistical differences between the groups on TSI scores ($t(44) = -0.20$, $p = 0.84$). Overall, this suggested that both groups were similar prior to the intervention.

Data Collection Procedures

This non-experimental study utilized archived data stored at MCC. Student level data that were requested included ethnicity, gender, first-generation status, and TSI scores, which were used to determine the student population that attended the summer bridge program. The demographic information was requested for all summer bridge program participants from 2014–2016. The researcher also requested selection of the comparison group comprised of 30 students that attended MCC during the same time frame and had characteristics similar to that of the summer bridge participants. The vice president of institutional research collected the summer bridge participants' demographics, TSI scores, grades in DE courses, and the number of credits earned. The student demographic characteristics of gender, ethnicity, and first-generation status were used to determine what student population used the summer bridge program. The same student characteristics also were used to select the comparison group to analyze the outcome of credit hours accumulated. The vice president of institutional research selected a comparison group comprised of 30 students with similar demographics, gender, ethnicity, and first-generation status, and TSI scores to those of the summer bridge participants. The vice president of institutional research created the comparison group by inputting selected conditions and then randomly selecting 30 students who enrolled in the same semester as the participants.

Data Analysis

The statistical analysis test chosen for this study overall was correlation; Lomax and Li (2008) described a correlation study as one that determines the relationship between variables. Statistical correlation techniques include the bivariate, extensions of the bivariate, and the regression model. Correlational research is an important quantitative method in the field of education and was the analysis of choice for this study because it allowed evaluation of several variables simultaneously to determine the effect each had on the other. This study qualified as a correlation study, specifically of the bivariate relationship, because its purpose was to evaluate the magnitude and degree of the relationship present among the variables, including summer bridge participants' TSI scores, DE requirements, and average credit hours as well as the same criteria from a comparison group. The analysis used to address research question one was the paired t-test; research question two was evaluated with the chi-square and odds-to-ratio test, and research question three was tested with an independent t-test. Examining the relationship between participation in the MCC summer bridge program and the variables associated with each research question increased the understanding of the relationship between participation in the MCC summer bridge program and the student outcomes selected.

Results
Research Question One

The first research question addressed the extent to which students' TSI scores improved after they participated in the summer bridge program. All participants entered the program with TSI scores in math, reading, and/or writing that were below college ready, and the goal of the program was to increase their scores to a college-ready level. The term *college ready* is based on the prescribed measures of the TSI test. The TSI test is an instrument legislated in Texas to measure college readiness. Therefore, students' ability to achieve a college ready score on the TSI is the premise for the term *college ready* in this study. The researcher used the paired *t*-test to determine the extent to which participants' scores improved. This assessed the significance of the mean difference between students' TSI scores before and after participation in the summer bridge program. Groups were compared on math, reading, and writing separately because it was possible for a student to be college ready in one subject area while not college ready in another. The researcher then ran data through SPSS, Version 20, and examined boxplots to determine the presence of any outliers. The researcher then performed the Shapiro-Wilk test to determine whether the assumption of a normal distribution was met. If the data violated this assumption, the Wilcoxon signed-rank test was used instead.

Students' math TSI scores were extracted from the Excel worksheet to determine if assumptions of the test were met and to conduct the analysis. Out of the 30 total participants, 15 had both pre- and post-TSI math scores. Any students who were deemed college ready (351 or higher) or were missing either a pre- or post-TSI score were excluded from analysis. One outlier was detected that was more than 1.5 box-lengths from the edge of the box in a

boxplot. Inspection revealed that the value was not extreme, and it was retained in the analysis. The assumption of normality was not violated, as assessed by Shapiro-Wilk's test (p = 0.32). Results indicated that TSI scores for participants in the summer bridge program increased from the pre- to post-test ($t_{(14)}$ = 5.02, p < 0.01). Students who participated in the summer bridge program scored approximately one standard deviation higher on their TSI math exam than those who did not participate in the summer bridge program. The effect size was considered to be large (d = 1.29). See Table 1 for the results of the math paired t-test.

Table 1
T-Test for TSI Pre- to Post-Math Scores

	Mean Diff.	SD	SEM	Lower	Upper	t	df	p	d
Pre TSI–Post TSI	10.4	8.03	2.07	5.96	14.84	5.02	14	<.001	1.29

Next, students' reading TSI scores were extracted from the Excel worksheet to determine if statistical assumptions of the test were met prior to conducting the analysis. Out of the 30 total participants, nine were analyzed that had both pre- and post-TSI reading scores. Any students who were deemed college ready (350 or higher) or were missing either a pre- or post-TSI score were excluded from analysis. Three outliers were detected that were more than 1.5 box-lengths from the edge of the box in a boxplot. Inspection of the values revealed two were not extreme and one was extreme. After investigation, all three outliers were retained. The case identified to be an extreme outlier based on TSI score still matched the other participants in terms of ethnicity, gender, age, and socioeconomic status. The assumption of normality was not violated, as assessed by the Shapiro-Wilk's test (p = .074). Results indicated that participants' scores increased from the pre-to post-test (M = 3.33, SD = 5.634). Results indicated that the magnitude of the difference between the two groups was very large (d = 1.77) but this difference was not found to be statistically significant. Note that the sample size used for this comparison was small. These statistical results should be interpreted with caution to avoid type 2 error. Therefore, the researcher failed to reject the null hypothesis. See Table 2 for the results of the reading paired t-test.

Table 2
T-Test for TSI Pre- to Post-Reading Scores

	Mean Diff.	SD	SEM	Lower	Upper	t	df	p	d
Pre TSI–Post TSI	3.33	5.63	1.88	-9.998	7.665	1.775	8	.114	1.77

Finally, the researcher pulled students' writing TSI scores from the Excel worksheet to determine if assumptions of the test were met and to conduct the analysis. Out of the 30 total participants, 11 were analyzed that had both pre- and post-TSI reading scores. Any students who had a score deemed college ready (363 or higher) or were missing either a pre- or post-TSI score were excluded from analysis. After inspection of the boxplot, the researcher determined that the sample did not contain any outliers. The assumption of normality was not violated, as assessed by Shapiro-Wilk's test (p = 0.24). Results indicated that participants' scores increased from the pre- to post-test (M = 5.18, SD = 5.231), a statistically significant increase of 5.18, ((SE = 1.577), $t(10)$ = 3.285, p < .008). The mean difference was statistically significantly different from zero. The effect size was considered to be large (d = .990). Therefore, the researcher rejected the null hypothesis and accepted the alternative hypothesis. See Table 3 for the results of the reading paired t-test.

Table 3
T-Test for TSI Pre- to Post-Writing Scores

	Mean Diff.	SD	SEM	Lower	Upper	t	df	p	d
Pre TSI–Post TSI	5.18	5.23	1.58	1.668	8.696	3.29	10	.008	.990

Research Question Two
The second research question examined the relationship between participation in the MCC summer bridge program and the number of DE courses participants were required to complete. The participants' test results indicated that they were below college ready and needed one or two levels of DE courses. The researcher chose the chi-square for this research question to determine the independence between the two variables, students' placement in their DE course sequence, and their participation in the summer bridge program. The students were first grouped according to how many levels of DE they were required to take based on their entering TSI scores. To assess progress, these same students were then classified by how many levels of change they had based upon the final TSI score. Students were placed into three categories: no change, improved one level of DE, and improved two levels of DE. After running the chi-square test with the 35 participants' pre- and post-TSI scores, the researcher determined that the assumptions of the chi-square were violated. To run the chi-square, the assumption of each cell having a minimum of 5 entries must be met. In this study, one cell only contained 3 occurrences which violated this assumption. Consequently, the data were changed to a 2x2 format in which students were grouped according to those who changed in their DE

course placement and students who did not change in their DE course placement. However, this transformation of the data continued to result in violations to assumptions of the analysis. Therefore, a Fisher's exact test was used to compare groups on changes in course placement. The results of this test indicated that 17 (48.6%) changed at least one DE course level and 18 (51.4%) did not change the number of DE courses. The researcher found no statistically significant association between participation in the MCC summer bridge program and change in participants' DE placement as assessed by Fisher's exact test, ($p = 0.47$). However, the odds ratio of changing the number of DE courses revealed that students who participated in the summer bridge program were twice as likely to improve their level of DE course placement (0.524; 95% CI, 0. 12 to 2.34). See Table 4 for the odds to ratio test results.

Table 4
Odds Ratio Test for Changing DE Placement

	Odds Ratio	95% Confidence Interval	
		Lower	Upper
Odds Ratio for Placement Change	0.52	0.12	2.33
Participants with no change in placement	0.71	031	1.65
Participants who changed placement	1.36	0.70	2.67
N	35		

Research Question Three

The third research question asked to what extent the average number of accumulated MCC college-level credit hours differed between students who participated in the summer bridge program and the comparison group of students who did not. The number of accumulated credit hours was within two years of completing the program. There were 30 participants in each group. The independent *t*-test was chosen to determine whether there was a statistically significant difference between the mean number of accumulated MCC college-level credit hours earned by summer bridge students and the comparison group. After examining the data, it was determined that the assumption of a normal distribution was violated as assessed by the Shapiro-Wilk test. Thus, the Mann-Whitney U test was used to compare groups. A Mann-Whitney U test was run to determine if there were differences in the median number of accumulated MCC college-level credit hours between participants and the comparison group. The median number of accumulated MCC college-level credit hours was not statistically significantly different between the summer bridge program (*Mdn* = 14.00) and the comparison group (*Mdn* = 12.00), *U* = 321. 5, *z* = -1.91, *p* = 0.06, *r* = 0.35, using an exact sampling distribution for *U* (Dineen & Blakesley, 1973). See Table

5 for the results of the Mann-Whitney U test and other results.

Table 5
Accumulated MCC College-Level Credit Hours Between Participants and the Comparison Group

	Accumulated Credit Hours
Mann-Whitney U	321.50
Wilcoxon W	786.50
Z	-1.91
P	0.06

Discussion

The college administrators created the MCC summer bridge program as a holistic program that includes components to build academic skills with the ultimate goal of increasing students' post-TSI scores in reading, writing, and math to be at a college-ready level. The results from research question one revealed that the MCC summer bridge program demonstrated a statistically significant increase in students' math and writing scores. In terms of reading, the magnitude of the difference between groups was large (d = 1.77) but this finding was not statistically significant. Statistical significance is affected by the power to detect such differences, and the sample size in this study was small. These results could have been a type 2 error because the effect size was almost two standard deviations. The results were positive in that several students increased their TSI scores and thus benefited from attending the summer bridge program. Through investigation of the program's structure, the researcher found that each area of the TSI is given the same amount of preparation time. The results from the TSI reading results should be interpreted with caution, and administrators should not assume that because the results were not statistically significant that the program did not have a positive impact on reading scores.

The focus of research question two was the number of DE courses a student was required to complete. Students who participated in the MCC summer bridge program placed either one or two levels below college ready. The Fisher's exact test revealed no statistically significant difference in the number of students who decreased the DE courses they were required to take. The large difference is not statistically significant but could be due to the size of the sample size. In this small of a sample, the type 2 error (false negative) could have caused the statistical conclusions to be incorrect. However, although the results were not statistically significant, the odds-to-ratio test revealed that students who participated in the summer bridge program were twice as likely to improve their level of DE course placement. Decreasing the number of DE courses required by almost 50% would have a positive effect on the MCC campus by reducing the number of students who are required

to enroll in DE courses and increasing those who can take college-level courses. Of the 17 students who decreased their number of DE courses, three began with pre-TSI scores two levels below college ready and ended with college-ready TSI scores. These results were promising in that they showed that several students made gains that allowed them to become college ready by the end of the MCC summer bridge program. However, no evidence from this study suggests that students who reduced their number of DE courses were more prepared or more successful in the college-level courses. Therefore, the possibility remains that despite the score-raising that the summer bridge program afforded, students may still have struggled in the end with the college-level courses. A recommendation for the program is to continue to operate as it has been since 2014, continue to collect more data, and see if the same results persist.

The results showed that 17 students succeeded in reaching the goals of the summer bridge program by either reducing or completing DE course requirements before entering their freshman year. This allowed these students the chance to eliminate or reduce one barrier with which they presented originally. If MCC can implement strategies to increase enrollment in the summer bridge program, it may be possible for the institution to reduce further the number of DE students who enter the institution as freshmen. The reduction of DE course requirements could save students hundreds of dollars per class and save the institution thousands by reducing the number of DE course sections.

Limitations

Although these results were promising, scholars should interpret them with caution because of the limitations of this study, which included only a small number of students at one location. This small sample size limited the ability to determine whether the results reflect a real difference or random fluctuations in the data. Further, the study was strictly quantitative, which limits the ability to determine whether other factors, such as the students' motivation or other personal differences, influenced their performance in the program. Allen and Bir (2012) conducted a study focused on the link between academic confidence, student GPA, and persistence. The researchers found a connection between students' level of academic confidence and increased persistence and GPAs. In another study, Strayhorn (2011) set out to determine if participation in a summer bridge program affected students' level of academic self-efficacy and their sense of belonging. Strayhorn (2011) found positive results with increased self-efficacy and certain academic skills. This study conducted at MCC should be replicated with a larger population and would be strengthened by using a mixed methods design like the one used in the Strayhorn (2011) study.

Research question three addressed the number of college-level credit hours accumulated, which was used to determine whether the program had any longitudinal effects. The results obtained showed no statistically significant difference between the comparison group and summer bridge program participants. During the first analysis, research on the MCC summer bridge program appeared to have no longitudinal effect on students' success in earning college credits; however, the participants in the summer bridge program did accumulate more college credit hours, which may be attributable to the fact that almost half of the participants reduced their DE requirements. The participants in the summer bridge program group accumulated 14 college credit hours, and the comparison group accumulated twelve. Although not statistically significant, the fact that the participants in the summer bridge program group accumulated more college credit hours than did the comparison group is promising, as one of the program's goals is to give DE students the opportunity to complete their course requirements, enroll in college-level courses sooner, and ensure success in college-level courses.

Conclusion

MCC designed its summer bridge program to support students who enter college in need of DE coursework by creating a holistic summer bridge program intended to increase participants' TSI scores to make them college ready. The literature review revealed mixed results of previous studies, and the results of this study were similar. The same caution discussed in the literature review should be applied to this study in that the way in which the data are interpreted can affect whether the study appears to support the MCC summer bridge program as an effective program for DE students. Johnson-Weeks and Superville's (2014) study found no statistically significant differences in GPAs or grades between the control group and those who participated in their summer bridge program; however, they did find results of practical significance in that participants had GPAs and grades comparable to students who entered their postsecondary education college ready. The same type of reasoning can be applied to the results of this study in that there were no statistically significant differences in several participant outcomes, but that does not mean their practical significance is any less important.

The results of this study add to a growing body of research over the past decade as more institutions have implemented summer bridge programs and are trying to determine the reasons for their successes and failures. The MCC summer bridge program has a unique structure and components, which can make it challenging to apply the results obtained here to any other institutions or populations. The purpose of this study was to provide the administrators at MCC guidance in identifying the strengths of the program and areas that require improvement. The mixed results

provide MCC with some evidence that they are influencing DE students' lives in a positive way and directions for ways in which to increase the success of future students.

References

ACT. (2017). *Solutions for college and career readiness.* Retrieved from http://www.act.org

Adams, C. (2012, May). Colleges offer incoming freshmen a summer 'bridge.' *Education Week, 31*(30), 8.

Allen, D. F., & Bir, B. (2012). Academic confidence and summer bridge learning communities: Path analytic linkages to student persistence. *Journal of College Student Retention: Research, Theory & Practice, 13*(4), 519-548.

Aud, S., Hussar, W., Johnson, F., Kena, G., Roth, E., Manning, E., Wang, X., & Zhang, J. (2012). *The Condition of Education 2012* (NCES 2012-045). U.S. Department of Education, National Center for Education Statistics. Washington, DC. Retrieved from https://nces.ed.gov/pubs2012/2012045.pdf

Barnett, E. A., Bork, R. H., Mayer, A. K., Pretlow, J., Wathington, H. D., & Weiss, M. J. (2012). *Bridging the gap: An impact study of eight developmental summer bridge programs in Texas.* New York, NY: National Center for Postsecondary Research.

Baum, S., & Payea, K. (2013). *Education pays 2013: The benefits of higher education for individuals and society.* New York, NY: The College Board. Retrieved from http://trends.collegeboard.org/sites/default/files/education-pays-2013-full-report

Bir, B., & Myrick, M. (2015). Summer bridges' effects on college student success. *Journal of Developmental Education, 39*(1), 22.

Buck, C. B. (1985). *Summer bridge: A residential learning experience for high risk freshmen at the University of California, San Diego.* (Report No. CG-018-690). Retrieved from ERIC database. (ED264462).

Castleman, B. L., Arnold, K., & Wartman, K. L. (2012). Stemming the tide of summer melt: An experimental study of the effects of post-high school summer intervention on low-income students' college enrollment. *Journal of Research on Educational Effectiveness, 5*(1), 1-17.

Dineen, L. C., & Blakesley, B. C. (1973). Algorithm AS 62: Generator for the sampling distribution of the Mann-Whitney U statistic. *Applied Statistics, 22*, 269-273.

Johnson, B., & Christensen, L. (2010). *Educational research: Quantitative, qualitative, and mixed approaches.* Boston, MA: Allyn and Bacon.

Johnson-Weeks, D. R., & Superville, C. R. (2014). An evaluation of the academic effectiveness of a summer bridge program. *Global Education Journal, 2014*(4), 1-19.

Kallison, Jr., J. M., & Stader, D. L. (2012). Effectiveness of summer bridge programs in enhancing college readiness. *Community College Journal of Research and Practice, 36*(5), 340-357.

Lomax, R. G., & Li, J. (2008). Correlational research. In E. M. Anderman (Ed.), *Psychology of classroom learning: An encyclopedia* (pp. 275-278). Detroit, MI: Macmillan.

Maggio, J. C., White Jr., W. G., Molstad, S., & Kher, N. (2005). Prefreshman summer programs' impact on student achievement and retention. *Journal of Developmental Education, 29*(2), 2-4.

Myers, C., & Drevlow, S. (1982, March). *Summer bridge program: A dropout intervention program for minority and low-income students at the University of California, San Diego.* Paper presented at the Annual Meeting of the American Educational Research Association, New York, NY.

Pretlow, J., & Wathington, H.D. (2012). Cost of developmental education: An update of Breneman and Harlow. *Journal of Developmental Education, 36*(2), 4-44.

Slade, J., Eatmon, D., Staley, K., & Dixon, K. G. (2015). Getting into the pipeline: Summer bridge as a pathway to college success. *The Journal of Negro Education, 84*(2), 125-138.

Strayhorn, T. L. (2011). Bridging the pipeline: Increasing underrepresented students' preparation for college through a summer bridge program. *American Behavioral Scientist, 55*(2), 142-159.

Tinto, V. (1988). Stages of student departure: Reflections on the longitudinal character of student leaving. *The Journal of Higher Education, 59*(4), 438-455.

Tinto, V. (2006). Research and practice of student retention: What next? *Journal of College Student Retention: Research, Theory & Practice, 8*(1), 1-19.

Van Gennep, A., & Caffee, G. L. (1960). *The rites of passage.* (M. B. Vizedon & G. L. Caffee, Trans.). New York, NY: Routledge & Kegan Paul.

Vermunt, J. D. (1996). Metacognitive, cognitive and affective aspects of learning styles and strategies: A phenomenographic analysis. *Higher education, 31*(1), 25-50.

Walpole, M., Simmerman, H., Mack, C., Mills, J., Scales, M., & Albano, D. (2008). Bridge to success: Insight into summer bridge program students' college transition. *Journal of the First-year Experience & Students in Transition, 20*(1), 11-30.

Wathington, H., Pretlow, J., & Mitchell, C. (2011). *The impact of developmental summer bridge programs on student success.* Paper presented at the Society for Research Educational Effectiveness (SREE) Spring 2011 Conference, Washington, DC.