The Role of Supplemental Instruction in Success and Retention in Math Courses at a Hispanic-Serving Institution

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ABSTRACT

Student retention has been a challenge for higher education institutions, an urgent issue that must be reassessed and improved at these institutions. One of the biggest challenges is not only increasing retention at Hispanic-serving institutions (HSIs), but additionally supporting the Science, Technology, Engineering, and Math (STEM) courses at these institutions. Supplemental Instruction (SI) has been confirmed by multiple researchers to increase retention and academic success among students in higher education, particularly among minority students. The purpose of this study was to evaluate and discover the impact SI had on retention and academic success for Hispanic students in mathematics courses at a south Texas HSI. The results showed a significant difference in final course grades and course completion for Hispanic students between select groups. The significant main effect that impacted academic success and course completion among Hispanic students at an HSI was SI participation.

Keywords: student retention, supplemental instruction, Hispanic-serving institutions, STEM

INTRODUCTION

Student retention has been a challenge for higher education for many years (Astin, 1975) with attrition presenting itself as a costly problem (Congos & Shoeps, 1993). This is an urgent issue that must be reassessed and improved at postsecondary institutions. Although enrollment rates for Hispanic college students have been high, the achievement gap remains steep (Fry, 2002). It is imperative that Hispanic-serving institutions (HSIs), having a high percentage of Hispanic populations, find ways where they will support and retain this growing number of degree-seeking students.

Many HSIs around the country have identified the biggest challenges to be addressed in the 21st century as issues in student success and retention among their students (De los Santos & Cuamea, 2010). Low graduation rates among underserved students can be attributed to a very weak high school curriculum with lower-level math and reading courses (Twigg, 2005; Noeth & Wimberly, 2002). Schmidt (2003) reported that 17-year old Hispanic high school students have the same reading and mathematics skills as White 13-year olds in middle school. Hispanic high school students are less likely to take college preparation courses than their White peers, hence delaying them further in higher education. For those who do pursue a college education, many Hispanic students are confronted with one of the most common weaknesses that institutions possess, which is the "predominant form of collegiate instruction: the didactic lecture" (Twigg, 2005, p. 21). The lecture method assumes that all students enter into college at the same level of academic preparedness, same learning styles, and same ability to learn. Traditional lecture formats minimize the opportunity to learn collaboratively or encourage active participation (Twigg, 2005).

Also, one of the biggest challenges for HSIs is not only increasing retention, but also supporting the Science, Technology, Math, and Engineering (STEM) pipeline at these institutions (Laden, 1999, 2000, 2001; Gates, 2010). There is a need to broaden participation in STEM majors and careers by including underrepresented minorities and women, since there are a disproportionate number of both causing a leaky pipeline in colleges and universities in the United States (NSF, 2008; Blickenstaff, 2005; Seymour, 1995; Weinburgh, 1995).

Past research indicates the challenges undergraduate students face in introductory math and science courses are a result of highly competitive classrooms or a lack of active participation, deterring students from pursuing a STEM degree (Gainen, 1995; Seymour & Hewitt, 1997). Grades received in STEM introductory courses, or more commonly referred to as STEM gateway courses, are associated with a higher probability of majoring in STEM disciplines (Rask, 2010). The level of academic achievement demonstrated by students in STEM gateway courses is a good predictor of their continued progression and degree attainment in STEM disciplines (Seymour & Hewitt,

1997; Seymour, 2002). Moreover, Hammarth (2006) argues that the probability of a student achieving in STEM fields is dependent on their access and completion of rigorous gateway courses in math and science.

HSIs are familiar with the barriers facing minority students and tend to provide students with additional support, including academic support programs. Merisotis and McCarthy (2005) affirm offering high levels of academic support through faculty, peer mentoring, or tutoring programs will not only attract more Hispanic students to higher education, but also keep them until graduation.

PURPOSE OF THE STUDY

There are numerous studies that have addressed the need and importance for academic support programs in order to increase academic success, sense of belonging, academic and social integration, and retention rates among Hispanic students (Benitez & DeAro, 2004; Gastic & Nieto, 2010; Maestas, Vaquera, & Zehr, 2007). A study by Kane and Henderson (2006) evaluated several student support services through an academic learning center at a Hispanic-serving institution and found the biggest increase in success rates were from the students who chose to participate in SI versus other support programs. Holek (2008) specifically set out to discover the impact SI has on the retention and graduation of students of color and found a positive increase of retention from the four ethnic groups identified: African American, Hispanic, Asian, and Native American.

SI sessions are designed to support student interaction and help create connections that provide for collaborative learning among disadvantaged students as well as high achieving students, which cultivate diversity (Arendale, 1994). SI has not only proven to increase retention and graduation rates among students in higher education (Bowles, McCoy, & Bates, 2008, Bowles & Jones, 2004), but also to promote higher confidence levels among students, increased student engagement, and higher levels of critical thinking towards academic achievement (Barlow & Villarejo, 2004; Congos, 2002; Wilcox & Koehler, 1996; Wolfe, 1987).

The HSI in this study received a federal grant awarded to HSIs that proposed to address science, technology, engineering, and mathematics (STEM) education. One of the intents of the federal grant was to increase the number of Hispanic and low income students attaining degrees in the fields of science, technology, engineering, and math. Since research has shown that SI has been effective in increasing success in math (Kenney & Kallison, 1994; Shaya, Petty, & Petty, 1993), it was chosen as the academic support program to be implemented. The purpose of this study was to evaluate if Supplemental Instruction impacted final grades in math courses and course completion among Hispanic students at a public, four-year south Texas Hispanic-serving institution.

The following research questions guided the study:

1. Does the SI attendance level have an effect on the mean final course grades in College Algebra for Hispanic students?
2. What are the main effects and interaction of SI and gender on course completion in College Algebra for Hispanic students?

REVIEW OF THE LITERATURE

The Retention Framework

Despite years of research on retention in higher education, the college student retention and graduation rates continue to be low among minority students, particularly among Hispanic students (Oseguera, Locks, & Vega, 2009). The earliest leaders of retention theory rooted their theories on personal, individual characteristics found in psychology, focusing on the traditional population of college students (Spady, 1971). Subsequently, the retention focus shifted to more sociological models involving college student departure theory (Tinto, 1975), social integration model (Tinto, 1987), and the theory of involvement (Astin, 1977). Retention theories have evolved by centering on the institution and how it relates to student integration (Tinto, 1994).

Cerna, Perez, and Saenz (2009) examined precollege attributes and values that influenced Hispanic students to attain a bachelor's degree and found disparities between this group and their peer groups reflecting "racial/ethnic educational opportunity gaps" in the U.S. (p. 143). Previous research has shown a deficit approach to Hispanic student retention by focusing on inadequate high school preparation or financial constraint, whereas Cerna et al. (2009) focused on characteristics that are essential in the success of undergraduate completion. The study suggests

focusing on precollege aspirations, perceptions, and values by nurturing the social and cultural capital Hispanics use to complete their degrees.

Retention and the Campus Climate

A study examining non-persistent decisions of Hispanic undergraduates conducted by Gloria, Castellanos, Lopez, and Rosales (2005) found that university comfort, social support, and self-belief were significant predictors in these decisions to remain in college. Moreover, the strongest values that Hispanics perceive to help them persist are the social support of their peers, mentoring relationships with faculty, and their perception of the university environment. Implementing "community-based efforts that involve family and friends within the recruitment and retention processes" is one way to support Hispanics in their pursuit to educational attainment (Gloria, et al, 2005, p. 216). Additionally, formalizing mentorship programs between Hispanic students and faculty does affect the educational experience and students' sense of self-efficacy which leads to success and persistence (Gloria et al., 2005).

There are many factors that can affect Hispanic student academic performance and retention; some of them include: overreliance on standardized examinations causing high levels of stress and bias, stereotype threat, cultural and social isolation, low expectations from teachers and peers, and non-supportive educational environments (Oseguera et al., 2009). Retention is much more than grades. Retention is the institutional commitment to a student's intellectual, social, and educational engagement.

Community and Hispanic Student Retention

Hispanic students tend to feel a need for connection to small communities that create, support, and extend positive outcomes for their future (Hurtado & Carter, 1997). Hispanic students place importance in belonging to some kind of community to their engagement and persistence in college, whether it is a religiously-affiliated, social, or just a community to discuss course content with peers outside of class. Similarly, having connections with other Hispanic students in college can prevent students from experiencing intimidating or threatening experiences (Gloria, Castellanos, & Orozco, 2005). Hispanic students seek positive and safe environments where they can interact with others and develop academically and socially.

Academic Barriers

Underserved students commonly enter into college with lower achievement test scores and entrance examination scores (Green, 2006). Low entrance exam scores contribute to the reason why underserved students delay college attendance or continue their education at a two-year institution versus a four-year institution (Chen, 2005). According to Twigg (2005), graduation rates for African Americans, Hispanics, Native Americans, and low-income students do not measure up to the overall graduation rates of other students. Fischer (2007) suggested that in the academic realm, minority students (Blacks, Hispanics, and Asians) who were better prepared prior to college received better college grades.

Economic Barriers

The financial burden that Hispanic students face in higher education is a barrier that is prevalent, contributing to their high attrition rates. Hispanic students are entering college with the lowest average socio-economic statuses among minorities; as a result, this affects their access to information, quality of education, and educational performance (O'Connor, 2009). Kane, Beals, Valeau, and Johnson (2004) identified two main obstacles to student persistence and success in STEM programs as being financial and off-campus employment. Many students seek off-campus employment in order to meet their living and educational expenses. Hispanic students are more concerned about paying for their education and have a strong sense of responsibility to take care of family in contrast to non-Hispanics who work to network or advance in their future careers (Longerbeam, Sedlacek, & Alatorre, 2004). Also, when first-generation students engage with their peers and with the institution, it makes a significant difference on their academic achievement. Often times, first-generation students' financial burdens and family responsibilities hinder this type of student engagement in college (Pascarella, Pierson, Wolniak, & Terenzini, 2004).

The STEM Education Pipeline at HSIs

As the United States looks to reinforce its workforce to compete globally in the areas of Science, Technology, Engineering, and Math (STEM), its focus must be on the institutions that are recruiting and educating the fastest growing population in the US, which are HSIs (Gates, 2010). Undeniably, HSIs play a critical role in preparing our

students; Gates (2010) argues that they hold an instrumental role in closing the gap of STEM college graduates and must be recognized and supported in their efforts.

Whalen and Shelley (2010) sought out to compare the academic success and six-year graduation rates between STEM and Non-STEM majors; their conclusion found that underrepresented students, female and minority students, in STEM majors are more likely to not remain in college or graduate within six years compared to the Non-STEM majors. In an effort to retain and graduate underrepresented students in the STEM disciplines, institutions of higher learning should implement support systems that could include study groups with like-minded students or involvement with professional STEM organizations that could diffuse the perceptions of STEM courses being too difficult (Whalen & Shelley, 2010).

Academic Support Programs at HSIs

With the changing demographics of colleges and universities in the United States today, it is imperative to understand Hispanic students in order to meet their social and academic needs. When De Los Santos and De Los Santos (2003) asked CEOs and Presidents of HSIs around the country to share important challenges or problems facing their institution, many stated student academic preparation, retention, and graduation among the top five issues. Many of the leaders related the fact that these issues are more prevalent because of their institution being an HSI. When asked what the biggest challenges were to be addressed in the 21st century, many HSI presidents around the country identified the top issues as student preparedness, student success, and retention among their students (De los Santos & Cuamea, 2010).

In order for academic support programs to be fully integrated, HSIs must incorporate connections between faculty and Hispanic students. Faculty members are essential resources for HSIs. Many researchers show that faculty and the level of interaction they have with students is associated to their success and persistence in college (Hubbard, 2005; Hubbard & Stage, 2009; Pascarella & Terenzini, 1991). The classroom can be a place where professors and students can become co-creators of knowledge by examining their personal biographies thus helping to clarify the reasoning behind why they are pursuing an education (Nunez, Ramalho & Cuero, 2010).

Supplemental Instruction: An Exemplary Academic Support Program

SI is a nationally regarded academic support program largely due to its unique design. Created in 1973 by Deanna Martin at the University of Missouri-Kansas City, it began in response to attrition issues among minority students (Widmar, 1994). More than thirty years later, the SI model continues to impact minority student success as it provides regularly scheduled, peer-facilitated, voluntary study sessions for all students in difficult courses (Hurley, Jacobs, & Gilbert, 2006). It supports high-risk classes, that typically have an attrition rate of 30 percent or higher with high D or F grades (Martin, Lorton, Blanc, & Evans, 1977), instead of high risk students avoiding the stigma of remediation (Arendale, 1994).

There are many key features that continue to distinguish the SI program from other academic assistance programs which include the SI leader, the SI supervisor, the student, and faculty who all make positive differences in academic success and institutional retention rates (Hurley, Jacobs, & Gilbert, 2006). The SI leader is identified as one who has taken the course previously, mastered the course, and possesses sufficient interpersonal skills to facilitate a group study session. The critical elements of the leader position is to attend all class sessions, take notes, read class materials, and conduct SI study sessions several times a week to review content material with students. The student is an integral part of SI as they are placed in a more active role in processing information and they are given ownership over their own learning. The SI Supervisor acts as an external agent identifying high-risk courses, selecting and training SI leaders, evaluating SI sessions, and assessing the SI program. The faculty role is essential as they encourage students in their class to attend the SI study sessions and they assist in the success of students and the SI program (Zartisky & Toce, 2006). Each of these key people working in conjunction with one another is what creates an effective program in helping students succeed in select courses. As a result of the program structure and philosophy, SI was selected in 1981 as one of the few Exemplary Educational Programs in postsecondary education (Arendale, 2002).

SI is an academic support program that is offered at the beginning of the semester. The proactive versus reactive approach in learning content is fundamental to SI's success with students (Arendale, 1994). The heart of the SI program is to reach students before they face academic difficulties in high-risk courses. Many higher educational institutions implement early alert programs where they identify students in need of intervention; yet, many of these

interventions come when students have failed their first exam or are experiencing academic difficulties. SI, on the other hand, is deliberate in addressing student attrition before it becomes a concern to the student, faculty, or institution.

SI sessions are designed to support student interaction as they construct knowledge and collaborate with one another, which can be integrated with learning communities among students (Painter, Bailey, Gilbert, & Prior, 2006). These types of connections that form peer study groups provide for collaborative learning among disadvantaged students as well as high achieving students, which in turn cultivates diversity (Arendale, 1994). Barlow and Villarejo (2004) stated that by implementing the SI program institution-wide, graduation rates are not only increased, so is the level of confidence of SI participants. Additionally, the incorporation of SI has also been shown to create a welcoming climate for all students, particularly minority and women students who may feel somewhat isolated.

Mathematics Success

SI has shown to be effective in entryway mathematics courses by "enhancing undergraduate education and reducing attrition" (Kenney & Kallison, 1994, p. 81). In an evaluation of SI with two studies of Calculus for Business students and Calculus for Engineering and Natural Science students, Kenney & Kallison (1994) found in their comparison study that the SI group had significantly higher course grades than the non-SI student group and found that the "exposure to SI techniques appeared to help the lower-ability students disproportionately more than the higher-ability students" (p. 80). These results suggested that higher-ability students may find their own ways of learning the subject where the lower-ability students need to learn the study skills. The higher ability students find the unrelated content to not be useful or they utilize the time to become more efficient learners. SI sessions may not help improve grades for these students, but may help in less study time.

Recent research has found SI or a form of peer-assisted learning to have positive effects on performance in mathematics. Parkinson (2009) found that those students who were engaged in peer assisted learning (PAL) support in mathematics increased their performance with in-house tests in calculus, showed improvement in exam grades, and decreased failing rates in comparison to those who did not receive any support. Cheng & Walters (2009) conducted an observational study on the impact of peer-assisted learning (PAL) sessions on student success in two undergraduate math courses. The results suggested that the attendance to PAL sessions correlated with student success in mathematics.

After removing the selection bias of prior GPA and gender differences that has been questioned in SI, there still remains a significant increase in grades in mathematics for SI participants compared to non-SI participants. Fayowski and MacMillan (2008) discovered that despite student motivation, prior academic success (GPA), or gender, students attending SI for a calculus course earned higher grades due to a social and supportive context in which students are able to process, dialogue, and break down information to learn.

METHODOLOGY AND RESEARCH DESIGN

A quantitative approach was used for this study on the role of SI in academic success and retention since it is the most conducive for systematically analyzing SI data, comparing SI groups, and assessing the SI program to make inferences. The quantitative design for this investigation used archival data from the SI program for the time period beginning in the fall semester of 2009 through the spring semester of 2010. The rationale for the archived data during the 2009-2010 semesters being chosen is due to: 1) the financial funding by the Department of Education Title V grant to support the SI program, 2) the increased number of science and mathematics courses aligned with SI at that particular time, and 3) the extensive data collected during the time period.

The variables that were analyzed in this study include: 1) three groups of SI attendance, 2) final course grade, 3) course taken, and 4) gender. The independent variable that was defined as the "treatment variable" by Creswell (2009), were the number of SI sessions attended, which were divided into three groups. The non-SI group was defined as zero SI sessions attended, the low group was defined as 1-10 SI sessions attended, and the high group was defined as 11or more SI sessions attended in one semester. In addition, gender (male or female) was an independent variable. The dependent variables, "the outcomes or results variables" as Creswell (2009, p.146) refers to them, were course completion rates and final course grades for this study. According to Rask (2010) course grades in STEM

gateway courses have the most consistent and important influence on the decision to progress in a STEM related major.

Population and Sample

The population of the study consisted of all undergraduate students enrolled in College Algebra I courses during the 2009-2010 year at a Hispanic-serving institution in south Texas. SI targets courses that have been designated to be barrier courses and have a 30% or higher D or F grades or withdrawal rates among students (Blanc, Debuhr & Martin, 1983). At this particular Hispanic-serving institution, College Algebra I fell into the 30% criteria. The mathematics course that was analyzed in this study was the required College Algebra I general education course.

This study's sample was comprised of all undergraduate Hispanic students who were enrolled in College Algebra I courses during the 2009-2010 year. There were 42 possible SI sessions per semester for students to attend or approximately 84 sessions for the academic year. The sample analyzed Hispanics students' level of SI attendance, gender, course completion, and final course grade. The selection process in this study was based on students that were enrolled in the College Algebra I course and were identified with the institution as Hispanic students.

RESULTS

SI Effect on Final Grades

A One-Way ANOVA statistical test was used in order to answer research question 1: Does the SI attendance level have an effect on the mean final course grades in College Algebra I for Hispanic students. The SI attendance level variable was solely based on total number of SI sessions attended with the mean score for the College Algebra I course, MATH 1314. The mean and standard deviation for final grades based on SI attendance levels for the College Algebra I course is noted in Table 1.

Table 1: Mean and Standard Deviation for Final Grades

Course Number	Session Attendance Level	Mean	SD	N
MATH 1314	Non-SI	2.32	1.803	197
	Low	2.82	1.615	119
	High	3.21	1.626	56

The final grade mean for College Algebra I courses showed an increase in the means between SI attendance levels. As SI attendance increased so did the final grades among Hispanic students. The means for final grades increased from the non-SI level (M = 2.32, SD = 1.80), to the low SI level (M = 2.82, SD = 1.62), to the high SI level (M = 3.21, SD = 1.63). Comparing the non-SI level to low SI level in the mathematics course a mean difference of .50 was found and between the non-SI and high SI level a difference of .89 was found. The descriptive data demonstrated a slight increase in final grades between those who did not attend SI and those who did participate in SI.

A One-way ANOVA was conducted to evaluate the mean difference between the SI attendance levels and the final grades in math. The One-way ANOVA indicated there was a significant difference between the SI attendance levels and final grades F (2, 372) = 7.12, p = .001, partial η^2 = .037. The effect size for the SI session level analysis was considered small with a partial eta square of .037, meaning that 4% of the variance in the grades was due to SI.

Post hoc tests were conducted to analyze if a certain SI level (non-SI, low, or high) was more effective in increasing final grades in math among Hispanic students. The follow-up tests consisted of all pairwise comparisons among the three levels of SI attendance. The Tukey Honestly Significant Difference (HSD) procedure was used to control for Type I error across the pairwise comparisons. The results are found in Table 2.

Table 2: Comparisons of SI Session Levels Effect on Final Grades

	Session Attendance Level	Session Attendance Level	Mean Difference	Sig.
Tukey HSD	Non-SI	Low	-.50*	.036
		High	-.89*	.002
	Low	High	-.40	.325

*The mean difference is significant at the .05 level.

The results of this analysis indicated that there was a significant difference in final grade means between the non-SI level (M = 2.32, SD = 1.80) and the low SI level (M = 2.82, SD = 1.62), $p < .05$. There was also a significant difference in final grade means between non-SI (M = 2.32, SD = 1.80) and high SI attendance levels (M = 3.21, SD = 1.63), $p < .05$. However, there was not a significant difference in final grades between low SI level (M = 2.82, SD = 1.62) and high SI level (M = 3.21, SD = 1.63), $p < .05$.

Although there were no mean differences between those students in the low attendance and high attendance levels, SI participation did make a difference in course final grades for Hispanic students. The results of this comparison supported the research hypothesis. There were significant differences between non-SI and low and high attendance at SI sessions on final course grade in math for Hispanic students. There was no significant difference between low and high attendance at SI sessions on final course grade in math for Hispanic students.

SI Effect on Course Completion

A Two-way ANOVA was conducted to determine the effect of the independent variables, three levels of SI attendance (non-SI, low, high) and math course taken, on the dependent variable, final grades. The SI attendance level variable was solely based on total number of SI sessions attended with the mean score for the classes in each subject. The course variable was based on the total compilation of classes in College Algebra I.

A Two-way ANOVA statistical test was conducted. The means and standard deviations for course completion in mathematics as a function of the two factors, SI attendance and gender, are presented in Table 3.

Table 3: Means and Standard Deviations for Math Course Completion

Gender	SI Attendance Level	Mean	SD
Male	Non-SI	.57	.50
	Low	.65	.48
	High	.86	.36
Female	Non-SI	.62	.49
	Low	.84	.37
	High	.86	.36

The means showed a steady increase between non-SI to low SI and low SI to high SI attendance levels with both males and females. In College Algebra I courses, the means for course completion among male Hispanic students increased from the non-SI level (M = .57, SD = .50), to the low SI level (M = .65, SD = .48), to the high SI level (M = .86, SD = .36). The means for math completion among female Hispanic students also increased from the non-SI level (M = .62, SD = .49), to the low SI level (M = .84, SD = .37), and to the high SI level (M = .86, SD = .36). The descriptive data revealed a course completion increase between the non-SI to low SI attendance level and the non-SI to high SI attendance levels for mathematics for both males and females.

A Two-way ANOVA was performed to evaluate SI attendance levels and gender main effects and the interaction between SI attendance levels and gender on math course completion. Math course completion was defined as the

dependent variable and gender and SI session levels were defined as factors. The Two-way ANOVA indicated no significant interaction between SI attendance levels and gender $F(2, 366) = 1.26$, $p = .29$, partial $\eta^2 = .007$) and no significant main effect for gender $F(1, 366) = 2.26$, $p = .13$, partial $\eta^2 = .006$). There was a significant main effect for SI session level $F(2, 366) = 8.60$, $p < .05$, partial $\eta^2 = .045$ for math course completion. The effect size for the SI session level analysis was small $\eta^2 = .045$, meaning that 5% of the variance in course completion was due to SI. The results showed that there was no significant difference in course completion means between Hispanic males and females. Nonetheless, the results revealed there was a significant difference in the means of course completion between the SI attendance levels.

Post hoc tests were conducted to analyze the significant main effect of SI session levels to examine if a certain SI level (non-SI, low, or high) was more effective for course completion in College Algebra I. The follow-up tests consisted of all pairwise comparisons among the three types of SI session levels for math completion. To control for Type I error, Tukey's HSD correction procedure was used across the pairwise comparisons. These results are shown in Table 4.

Table 4: Multiple Comparisons of SI Participation Level on Math Course Completion

	Session Attendance Level	Session Attendance Level	Mean Difference	Sig.
Tukey HSD	Non-SI	Low	.14*	.027
		High	.26*	.000
	Low	High	.13	.206

* The mean difference is significant at the .05 level.

The results of the comparative analysis indicated that there was a significant difference in course completion means between the non-SI level ($M = .59$, $SD = .49$) and the low SI level ($M = .73$, $SD = .45$), $p < .05$. There was a significant difference in course completion means between non-SI ($M = .59$, $SD = .49$) and high SI attendance levels ($M = .86$, $SD = .35$), $p < .05$). There was no significant difference in course completion means between low SI level ($M = .73$, $SD = .45$) and high SI level ($M = .86$, $SD = .35$), $p = .206$. The results indicated there were differences in course completion between Hispanic students who participated and those who did not participate in SI sessions. Hispanic students who participated in SI have higher course completion means in College Algebra I, yet the numbers of sessions did not appear to make a difference in math course completion.

There were significant differences between non-SI and low SI levels and between non-SI and high SI level attendance at SI sessions on course completion in the area of mathematics for Hispanic students. Based on the results the null hypothesis was rejected. Conversely, there were no significant differences in gender on course completion in the area of mathematics for Hispanic students. Likewise, there were no significant interactions between gender and SI attendance on course completion in College Algebra I for Hispanic students.

DISCUSSION

In order to evaluate SI's impact on final grades in College Algebra among Hispanic students, a One-Way ANOVA was used. The statistical analysis tested the mean difference in final grades among SI attendance levels. The One-Way ANOVA results indicated there was a significant difference between the SI attendance levels and final grades. Follow-up tests were conducted and showed there was a significant difference in final grade means between the non-SI level and the low SI level and between non-SI and high SI attendance levels. There was no significant difference between low SI and high SI level. There was a significant difference in math final grades for Hispanic students who attended SI sessions versus Hispanic students who did not attend SI sessions. These results supported the literature that SI can increase final grades and success in mathematics when students attend peer-facilitated study sessions (Cheng & Walters, 2009; Fayowski and MacMillan, 2008; Kenney & Kallison, 1994; Parkinson, 2009).

To evaluate SI's impact on course completion in College Algebra I among Hispanic students, a Two-way ANOVA test was run. The analysis tested math course completion based on SI attendance levels and gender. The Two-way ANOVA indicated there was a significant difference between SI session levels on course completion. There was no significant difference between male and female course completion in mathematics and no significant interaction between SI attendance level and gender in math course completion. Follow up tests were conducted on the

significant main effect for SI session level to evaluate which attendance level was more effective on course completion. The results of the post hoc tests indicated a significant difference between the non-SI group and low SI level and a significant difference between the non-SI group and high SI level. There was no significant difference between low SI and high SI level.

There was a significant difference in math course completion for Hispanic students who attended SI sessions versus Hispanic students who did not attend SI sessions. The results supported past literature showing that SI can reduce attrition and enhance undergraduate education in gateway math courses (Kenney & Kallison, 1994), primarily among Hispanic students (Kane & Henderson, 2006). In addition, the study demonstrated there was no significance in gender, similarly, Fayowski and MacMillan (2008) found that despite gender, students attending SI for math courses had higher academic success than those who did not attend.

An interesting finding in the results indicated that there was no significant difference between the low SI level (1-10 sessions) and high SI level (11 or more sessions). The results indicated that as long as Hispanic students participated in SI, regardless of the number of times they attended or the students' gender, their retention rate in College Algebra increased. Nonetheless, the descriptive statistics should not be disregarded as it demonstrated a continued increase in mean course completion between each SI attendance level. The descriptive data pointed towards an increase between non-SI, low SI level, and high SI level. The descriptive data illustrated an increase in the course completion of Hispanic students for each SI level, pointing towards increased student success with more SI participant engagement.

Although this study's results indicated no significant difference between the low and high SI attendance groups, further research should be conducted to answer deeper questions about SI and its effect on the targeted population. Since there could be multiple factors in a student completing a course or receiving a certain final grade, integrating qualitative data into the study to determine what other factors assisted in students' success could give a holistic perspective. Examining different SI features that have positive effects on Hispanic student outcomes may offer an extensive perspective on how SI contributes the most. One feature to examine in particular is the initial impact a SI learning community offers to Hispanic students. Do Hispanic students feel a sense of belonging in a SI learning community? Does attendance level matter in increasing student confidence in the subject matter? Employing a naturalistic inquiry method may give a more in-depth understanding on why SI is effective among Hispanic students and how it contributes to their academic success, primarily their persistence in mathematics courses.

CONCLUSION

HSIs have a high percentage of Hispanic student populations, so it is important that they find ways where they can support and retain the growing number of degree-seeking students. Many HSIs around the country have identified the biggest challenges to be addressed today is student success and retention among their students (De los Santos & Cuamea, 2010). Identifying and evaluating academic support programs that increases student success and retention is vital for HSIs to assure that their students have a chance to succeed on their campuses. The reason for this study was to discover how an academic support program impacts the academic success and retention of Hispanic students at a Hispanic-serving institution.

Past literature on academic support programs and the needs of students at HSIs provided some insights into factors that have been found in the success and retention of Hispanic students. The research focused on one particular nationally-acclaimed academic support program, SI. The factors identified in this research study were level of SI engagement, gender, and final grades among Hispanic students. The purpose of this quantitative research was to evaluate if SI impacted final grades and course completion in science and math courses among Hispanic students at a public, four-year south Texas Hispanic-serving institution.

The study evaluated SI's impact on final grades and course completion in College Algebra among Hispanic students. The results indicated that as long as Hispanic students participated in SI, despite the number of times they attended, their final grade and course completion rate in College Algebra increased. The results support when Hispanic students participate in SI sessions they are more likely to succeed in College Algebra.

There continues to be a gap between institutions' knowledge and practice in understanding and serving Hispanic students attending higher education. Many institutions have programs that address minority student success, but

often the effort is not focused (McGlynn, 2008). In order to increase persistence among Hispanic students, institutions must depart from its predominantly White cultural norms to become more inclusive of Hispanic college students (Hurtado & Ponjuan, 2005).

This study supports SI as an effective academic support program for increased academic success among Hispanic students at a HSI. These findings should encourage administrators with existing SI programs at HSIs to continue to promote SI among their students, particularly Hispanic students. The study should increase interest among administrators to invest more time and resources into SI in order to better support Hispanic students. Finally, for those institutions seeking to implement academic support programs to better support Hispanic students, results on the effectiveness of SI in this study confirmed it should be considered as part of their retention strategy.

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