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Supplemental Instruction: The Effect of Demographic and Academic Preparation Variables on Community College Student Academic Achievement in STEM-Related Fields

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Abstract

This study evaluated variables associated with academic preparation and student demographics as predictors of academic achievement through participation in supplemental instruction (SI) programs for community college students in Science, Technology, Engineering, and Math (STEM) fields. The findings suggest a differential impact of SI outcome for students based on gender and ethnicity. Furthermore, the study underscores the importance of evaluating the influence of academic achievement and student demographic variables when considering the development of SI programs on community college campuses.

Resumen

Este estudio evaluó variables asociadas con preparación académica y características demográficas del estudiante a través de la participación en programas de Instrucción Suplementaria (IS) para predecir el aprovechamiento académico en estudiantes preparatorianos en las áreas de ciencia, tecnología, ingeniería y matemáticas (siglas en Ingles STEM). Los hallazgos sugieren un impacto diferencial para estudiantes con IS basado en género y etnia. Aún más el estudio subraya la importancia de evaluar la influencia de las variables aprovechamiento académico y características demográficas del estudiante cuando se considera el desarrollo de programas IS en campus preparatorianos.

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Introduction

Many factors predict academic success in higher education, particularly within the community college system. Enrolling approximately one half of the nation's most diverse undergraduate population (Bryant, 2000; Foote, 1997), community colleges provide opportunities for students leading to graduation, transfer, and degree/certificate completion. The completion of a college degree is a challenge, and many students fail to earn their degree and reach their educational objectives (Bowen, Chingos, & McPherson, 2009). As a result, system leaders have established programs and support services aimed at increasing retention and enhancing academic success for the diverse student body associated with the community college system. One such program, supplemental instruction (SI), serves as a model utilized by institutions of higher education throughout the country (McGuire, 2006; Widmar, 1994).

Developed at the University of Missouri–Kansas City, SI focuses on improving overall student performance, increasing retention, reducing attrition, and improving college graduation rates (Bowles, McCoy, & Bates, 2008; Congos, 2003). SI relies on active out-of-class study sessions aimed at increasing student comprehension of course content and the integration of reasoning and study skills with specific course content (Martin & Arendale, 1992a). Open to all enrolled students within a course section, the program relies upon participation in small group interactions (SI sessions) in which students take an active role in determining the content to be discussed. During SI sessions, students interact collaboratively with one another to construct an accurate account of course information (Congos, 2002) in an attempt to integrate and to process course curriculum through discussion (Lockie & Van Lanen, 2008; Lundeberg & Moch, 1995). Through interactive discussion facilitated by an SI leader, students learn and assimilate course curriculum by focusing on the group understanding of course content (Bunce & Heikkiman, 1986; Lundeberg & Moch, 1995).

Typically, the SI leader is a successful student who has completed a course that used the SI program as a support service. The SI leader serves to assist in linking study and reasoning skills to course content during SI sessions. The SI leader models appropriate learning strategies and is typically responsible for attending class sessions, completing training workshops, communicating with the course instructor, and facilitating SI sessions. Viewed as a peer mentor and role model, the SI leader functions to create an open environment for students to engage in discussion, answer questions, acquire problem-solving skills, evaluate course content from multiple perspectives, and draw upon the collective knowledge of the group (Bowles et al., 2008; McGuire, 2006; Ogden, Thompson, Russell, & Simons, 2003; Zaritsky & Toce, 2006).

Successful SI leaders typically originate from supportive faculty members who actively advocate for SI session attendance within the classroom. Such faculty members advertise the SI program in their syllabi, utilize the SI leader as an active participant within the classroom setting, and provide supplemental materials and support for the SI leader throughout the duration of the term (Zaritsky & Toce, 2006). Successful interactions between the faculty member and the SI leader are imperative to the overall success of SI programs and the academic success of participating students.

Enhancing student achievement is significant for all courses, but particularly so for those with high failure and attrition rates. SI programs typically target courses with 30% or more D, F, and W grades. Commonly targeted courses include first- and second-year introductory courses, those that meet key prerequisite requirements, and those with large student enrollments (Kochenour et al., 1997). As such, introductory math and science courses and courses in STEM-related fields are commonly targeted. Instructors typically teach these courses via a traditional lecture pedagogy, which reduces interaction between students and faculty (Kardash & Wallace, 2001; Moriarty, 2007; Taylor, Gilmer, & Tobin, 2002) and rarely provides opportunities for discussion that lead to content mastery and the development of critical thinking (Burmeister, 1996;. Webster & Hooper, 1998). Focusing SI efforts on introductory courses in STEM-related fields provides opportunities for educators to expand the benefits of SI participation to a large student population.

Traditionally, SI programs function to provide opportunities to improve overall academic success to all students who are enrolled in the course. Research demonstrates that participation in SI enhances reasoning and problem-solving skills (Shaya, Petty, & Petty, 1993), increases retention (Lyle & Robinson, 2003; Ogden et al., 2003; Zaritsky & Toce, 2006), graduation rates (Bowles et al., 2008), and academic success (Congos, 2003; Gattis, 2000; Peters, Mani, Rasathurai, & Greene, 2007), including academic success in courses in STEM-related fields (Lyle & Robinson, 2003; Peters et al., 2007; Rath, Peterfreund, Xenos, Bayliss, & Carnal, 2007; Wynegar & Fenster, 2009). In addition, SI provides students the scaffolding necessary to learn and assimilate study skills that they take with them to future semesters (Fayowski & MacMillan, 2008; Peters et al., 2007).

The principle components of successful SI programs include faculty members, SI leaders, and a diversified study body. Much of the success of SI programs is predicated upon the relationships established between these key stakeholder groups (Lockie & Van Lanen, 2008; Rath et al., 2007; Zaritsky & Toce, 2006). Some studies report a differential impact on academic achievement based on ethnicity (Fjortoft, Bentley, Crawford, & Russell, 1993; Rath et al., 2007; Shaya et al., 1993). However, very few published studies evaluate the relationships between demographic and academic preparation variables with participation in an SI program in relation to academic achievement within the community college system. To properly construct, manage, and evaluate SI programs within the community college system, administrators and SI program coordinators must consider the impact of these variables on student achievement.

Method

This study evaluated participation in SI in relation to Astin's (1970, 1993) input-environment-outcome college impact model, which suggests that college outcomes

Table 1. Sample Demographics.

	Students		SI leaders		Faculty	
Demographic	*n*	%	*n*	%	*n*	%
Gender						
Female	1,107	59.1	24	54.5	11	40.7
Male	766	40.9	20	45.5	16	59.3
Ethnicity						
Asian	122	6.5	12	27.3	5	18.5
African American	90	4.8	0	0.0	0	0.0
Hispanic/Latino	1,023	54.6	15	34.1	4	14.8
American Indian	10	0.5	0	0.0	1	3.7
Pacific Islander	24	1.3	0	0.0	0	0.0
Multiracial	3	0.2	1	2.2	0	0.0
White	601	32.1	16	36.4	17	63.0
Person of color status						
Person of color	1,271	67.9	28	63.6	10	37.0
White	602	32.1	16	36.4	17.	63.0

depend on both the input and environmental experiences of students. According to this model, input variables consist of attributes students bring with them to college while environment variables consist of the people, programs, and cultures experienced by students as a result of their enrollment in college. This study applied Astin's model to evaluate the influence of input and environment variables associated with participation in SI on student achievement outcomes at a community college. In particular, the study evaluated the relationships between student demographics and academic preparation, faculty and SI member demographics, levels of participation in SI, and academic achievement. Demographic variables consisted of students' gender and ethnicity; preparation variables included prior grade point average (GPA; at the time of enrollment a course with an SI program) and scores on English and Math placement assessments at the community college where the study was conducted. Mediating variables included the number of SI sessions attended during the semester as well as the gender and race of SI leaders and course instructors. Two dependent variables, final course grade and cumulative GPA, were used as outcome measures.

Population and Sample

The participants in this study included students, SI leaders, and faculty members associated with courses offering SI at a community college Hispanic Serving Institution (HSI) in Southern California between Spring 2009 and Spring 2010. The sample included 1,873 students enrolled in one of five STEM disciplines: astronomy (9.8%), biology (53.9%), chemistry (12.4%), math (22.2%), and physics (1.6%). The remaining participants included 44 SI leaders and 27 faculty members. Table 1 reviews the demographics of students, SI leaders, and faculty. Note that due to the small sample size of some students of color groups, an additional dummy code variable was added for persons of color status. The majority of the students (67.9%) and SI leaders (63.6%) were persons of color. Conversely, only 37% of the faculty participants were persons of color.

Data Analysis

Data for the study originated from the Office of Institutional Research at the research site. Descriptive statistics, Pearson's r correlations, and collinearity diagnostics were calculated to ensure that all measurement assumptions were met. A series of simultaneous multiple regression analyses were then conducted to evaluate the relationships between independent and mediating variables with the measures of academic achievement. In addition to analyzing the entire sample, regression analyses were completed for four separate cohorts of students: females (n = 1,107), males (n = 766), students of color (n = 1,271), and White students (n = 602). This approach allowed us to assess the differential impact of each of these variables on student achievement based on student of color status and gender.

Results

Table 2 presents the results for five separate simultaneous regression analyses with the final course grade as the dependent variable. Among the input variables, the relationship between prior GPA and final course grade was the strongest ($\beta = .36$, $p < .001$). Among the four disaggregated cohorts, the relationship was strongest for males ($\beta = .41$, $p < .001$) and somewhat lower for females ($\beta = .33$, $p < .001$). Among mediating variables, the strongest relationship was between the number of SI sessions attended and final course grade ($\beta = .21$, $p < .001$). Thus, after controlling for the effects of input demographics, placement assessment scores, and the gender and ethnicity of both SI leaders and faculty, the strongest predictor of a higher final course grade was attending a larger number of SI sessions. After disaggregating the data, the relationship was stronger for students of color ($\beta = .23$, $p < .001$) than for White students ($\beta = .16$, $p < .001$), and slightly stronger for females ($\beta = .22$, $p < .001$) than for males ($\beta = .18$, $p < .001$). In addition, there was a difference in the relationship of faculty sex and final course grade for females ($\beta = .10$, $p < .01$) and males ($\beta = .04$), meaning that females had slightly higher grades when taking STEM classes taught by female instructors. Similarly, students of color had higher final course grades when female instructors taught the STEM courses ($\beta = .09$, $p < .01$) as compared with White students ($\beta = .05$).

However, given the small number of faculty in this study and the very small effect sizes, it may be that these differences reflect differences other than the gender of the course instructor. The same is true for the relationship between the ethnicity of the SI leader and final grades for students of color ($\beta = .09$, $p < .001$) and White students ($\beta = .06$). Overall, the collection of input and mediating variables explained 27% of

Table 2. Simultaneous Multiple Regression Analysis—Final Course Grade.

	Females			Males			Students of color			White students			Full sample		
Variable	*B*	*SE*	β	*B*	*SE*	β	*B*	*SE*	β	*B*	*SE*	β	*B*	*SE*	β
Input variables															
Prior GPA	.58	.05	.33***	.71	.06	.41***	.66	.04	.37***	.59	.07	.34***	.63	.04	.36***
English Placement	.10	.04	.08*	.11	.03	.09**	.11	.03	.09**	.08	.06	.06	.10	.03	.08***
Math Placement	.14	.03	.15***	.17	.03	.18***	.15	.02	.17***	.15	.04	.15***	.15	.02	.16***
Student Sex	—	—	—	—	—	—	.01	.07	.01	.01	.11	.01	.01	.06	.01
Student of Color	−.19	.08	−.07*	−.14	.09	−.05	—	—	—	—	—	—	−.17	.06	−.06**
Mediating variables															
Faculty Sex	.28	.08	.10**	.13	.09	.04	.25	.07	.09***	.16	.11	.05	.22	.06	.08*
Faculty of Color	.13	.07	.05	.06	.09	.02	.12	.07	.05	.06	.11	.02	.10	.06	.04
SI Leader Sex	−.05	.08	−.02	−.02	.09	−.01	−.11	.07	−.04	.09	.11	.03	−.04	.06	−.02
SI Leader of Color	.18	.08	.06*	.32	.09	.11***	.25	.07	.09***	.16	.11	.06	.23	.06	.08***
Sessions Attended (#)	.04	.01	.22***	.04	.01	.18***	.05	.01	.23***	.03	.01	.16***	.04	.01	.21***

Note. Female cohort: $F(9, 1{,}097) = 40.7$, $p < .001$, $R^2 = .25$; male cohort: $F(9, 756) = 36.0$, $p < .001$, $R^2 = .30$; student of color cohort: $F(9, 1{,}261) = 55.5$, $p < .001$, $R^2 = .28$; White student cohort: $F(9, 592) = 17.2$, $p < .001$, $R^2 = .21$; full sample: $F(9, 1{,}862) = 67.8$, $p < .001$, $R^2 = .27$.
$^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

Table 3. Simultaneous Multiple Regression Analysis—Cumulative GPA.

	Females			Males			Students of color			White students			Full sample		
Variable	*B*	*SE*	β	*B*	*SE*	β	*B*	*SE*	β	*B*	*SE*	β	*B*	*SE*	β
Input variables															
Prior GPA	.80	.02	.83***	.85	.02	.87***	.84	.01	.86***	.78	.02	.82***	.82	.01	.85***
English Placement	.01	.01	.01	.04	.01	.06**	.03	.01	.03	.02	.02	.03	.02	.01	.03*
Math Placement	.04	.01	.08***	.03	.01	.05***	.03	.01	.06***	.06	.01	.10***	.04	.01	.07***
Student Sex	—	—	—	—	—	—	−.01	.02	−.01	.02	.03	.02	.01	.02	.01
Student of Color	−.05	.03	−.03*	−.01	.03	−.01	—	—	—	—	—	—	−.03	.02	−.02
Mediating variables															
Faculty Sex	.01	.03	.01	−.01	.03	−.01	.02	.02	.01	−.02	.04	−.01	.01	.02	.01
Faculty of Color	.02	.03	.01	.03	.03	.02	.01	.02	.01	.07	.03	.05	.03	.02	.02
SI Leader Sex	−.01	.03	−.01	.01	.03	.01	−.02	.02	−.01	.05	.03	.04	.01	.02	.01
SI Leader of Color	.02	.03	.02	.06	.03	.04*	.06	.02	.04**	−.01	.03	−.01	.04	.02	.02*
Sessions Attended (#)	.01	.01	.10***	.01	.01	.07***	.01	.01	.09***	.01	.01	.08***	.01	.01	.09***

Note. Female cohort: $F(9, 1{,}097) = 392.8$, $p < .001$, $R^2 = .76$; male cohort: $F(9, 756) = 334.6$, $p < .001$, $R^2 = .80$; student of color cohort: $F(9, 1{,}261) = 500.1$, $p < .001$, $R^2 = .78$; White student cohort: $F(9, 592) = 208.3$, $p < .001$, $R^2 = .76$; full sample: $F(9, 1{,}862) = 646.76$, $p < .001$, $R^2 = .78$.
*$p < .05$. **$p < .01$. ***$p < .001$.

the variance (R^2) in final course grades, which is a moderate effect size. The variance explained for the four disaggregated cohorts ranged from 21% for White students to 30% for males.

Table 3 presents the results for five separate simultaneous regression analyses with students' cumulative GPA as the dependent variable. Among the input variables, the relationship with prior GPA was again the strongest, though the relationship was much stronger ($\beta = .85, p < .001$) than the relationship for final course grade. Among the four disaggregated cohorts, the relationships were slightly stronger for males ($\beta = .87, p < .001$) than for females ($\beta = .83, p < .001$) and for students of color ($\beta = .86, p < .001$) than for White students ($\beta = .82, p < .001$). These are unusually strong effect sizes for educational research studies (see Cohen, 1988), and these strong relationships were likely the reason that the full sets of variables explained high percentages of variance for the full sample ($R^2 = .78$) and for each of the four disaggregated cohorts ($R^2 = .76$-.80). Thus, it was uncommon that students' cumulative college GPA differed much from their prior GPA. In contrast, the relationships between math placement scores and students' cumulative GPAs were very small, though statistically significant; the relationship with GPAs for the English placement score was only statistically significant for males, and again at a very small level ($\beta = .06, p < .01$).

There were few statistically significant relationships between mediating variables and students' cumulative GPA. This was not surprising as the mediating variables were specific to enrollment in a single SI program and not to all of the courses that contributed to students' cumulative GPAs. In that light, it was interesting to observe the small, statistically significant relationship ($\beta = .09, p < .001$) between the number of SI sessions attended for a single STEM course and students' cumulative GPA.

Discussion

The impact of SI on academic achievement is well documented within the literature. Attendance at SI sessions generally correlates with increased final course grades (Martin, Blanc, & Arendale, 1996;. Webster & Dee, 1998), particularly for STEM-related disciplines (Rabitoy, 2011; Rabitoy, Hoffman, & Person, 2012). Participation in SI has been shown to enhance final course grades in biology (Hensen & Shelley, 2003; Moore & LeDee, 2006; Peterfreund, Rath, Xenos, & Bayliss, 2008; Rath et al., 2007), chemistry (Gattis, 2000, 2002; Lyle & Robinson, 2003), physics (Hensen & Shelley, 2003), and math (Fayowski & MacMillan, 2008; Lazari & Simons, 2003; Peters et al., 2007). The results of this study corroborate these findings and highlight the influence of SI attendance as well as demographic and academic preparation variables associated with SI programs within the community college system.

Demographic Variables

The results of this study indicated differences in the effect of SI on student populations based on gender and ethnicity.

Gender. This study identified differences in the impact of demographic and academic preparation variables on students based on their gender. Prior GPA served as a stronger predictor of final course grade and final cumulative GPA for males compared with females. The fact that prior GPA served as a greater predictor of academic success for males may indicate that male community college students are heavily influenced by their prior academic experience. If so, these results may also suggest that female students are more receptive to academic interventions than males and that to effectively reach male students academic administrators should evaluate their method of recruitment for male students and design programs that encourage their participation regardless of their prior academic experience.

While prior GPA served as a statistically significant predictor of academic success, the moderate effect size of the R^2 values in the study suggests that additional factors influence student performance. In particular, student of color status served as a negative predictor of final course grade and final cumulative GPA for females, but not for males. In addition, enrollment in a course section with a female faculty member served as a statistically significant predictor of final course grade for females, but not for males. Finally, SI session attendance served as a stronger predictor of final course grade for females as compared with males, and the R^2 value was higher for males in comparison with females for both final course grade and for cumulative GPA. This latter finding suggests that factors other than SI session attendance were stronger, more durable predictors of success for the males in this study.

Ethnicity. In addition to gender, differences in student ethnicity affected the influence of SI variables on academic achievement. For students of color, enrollment in a course section with an SI leader who was also a student of color served as a statistically positive predictor of academic achievement. This same demographic variable was not a statistically significant predictor of academic achievement for White students. The influence of SI session attendance served as a much stronger predictor of academic achievement for students of color in comparison with White students. In addition, the R^2 value for students of color explained a higher percentage of the variance on final course grade in comparison with White students. The only variable serving as a greater predictor on both final course grade and final cumulative GPA for White students in comparison with students of color was academic preparation, as measured by prior GPA.

These findings underscore the importance of evaluating demographic and academic preparation variables associated with participation in SI programs in STEM-related disciplines. The implications of these findings have relevance to leaders within the community college system responsible for the effective implementation of SI programs to a diversified student body.

Implications for Practice and Recommendations for Change

The majority of the published literature on SI has evaluated the impact of SI attendance on academic achievement. The results of this study suggest that the impact of both demographic and academic preparation variables should be considered when evaluating the effectiveness of SI programs on community college campuses.

SI participation in this study served as a positive predictor of both final course grade and final cumulative GPA, even after controlling for the effects of prior GPA and student assessment scores, indicating that student attendance at SI sessions is not, necessarily, reflective of academic preparation. Furthermore, the influence of SI participation extended beyond the individual class and positively influenced cumulative GPA, indicating that the benefits of attending SI influence student performance in other coursework. Such a finding is not unique within the literature (Fayowski & MacMillan, 2008) and suggests that providing access to SI early in the college career of a student can result in a significant improvement in overall academic achievement regardless of prior academic experience. Establishing funding sources that allow community college students to enroll in multiple courses offering SI during their freshman year would likely enhance their overall opportunity for success.

The open access mandate for community colleges results in a diversified student body entering the system with varying levels of academic preparation. In this study, prior GPA served as a stronger predictor of academic achievement for males as compared with females and for students of color as compared with White students. Females and students of color who entered the class with lower GPAs achieved lower final course grades and cumulative GPAs than their White and male counterparts. Furthermore, student of color status served as a negative predictor of academic achievement for females, but not for males. These same students, females and students of color, benefitted the most from participation in SI when compared with their White and male peers.

Many minority and underserved students enter college underprepared (Green, 2006; Parker, 1997; Tovar & Simon, 2006) and struggle to perform well in academic courses. To enhance the academic success of underprepared and at-risk students, administrators within the community college system must provide opportunities for participation in academic support service programs. SI is one such program, and research indicates that participation in the program provides significant benefits for at-risk students (Lazari & Simons, 2003; Ogden et al., 2003; Ramirez, 1997; Rath et al., 2007). In fact, several older studies indicate a disproportionate positive impact on academic achievement for ethnic minority students as a result of their participation in SI (Blanc, DeBuhr, & Martin, 1983; Fjortoft et al., 1993; Levin & Levin, 1991; Martin & Arendale, 1992b; Rath et al., 2007; Shaya et al., 1993). Peterfreund et al. (2008) found a similar relationship between SI participation and academic achievement in a more recent study.

Females and students of color represent a significant proportion of the community college student body (Bryant, 2000; Phillippe, 1997), a statistic particularly significant for HSIs with a significant number of ethnic minority students. To enhance the academic performance for students in this demographic, in particular, female students of color, community college administrators should target and recruit females and students of color for participation in SI programs. This should be done prior to arrival at the institution and should focus on the dissemination of information regarding the advantages associated with participation in SI and other academic support programs. In addition, establishing policies and procedures aimed at identifying at-risk students would help reach out to the very population who gain the most benefit from participation in such a program. Colleges could establish these policies and procedures through assessment scores upon entrance to the institution. Moreover, these procedures could be further established by sharing the benefits of SI during recruitment, mandatory campus orientations, campus tours, club events, advising, outreach, counseling, and the infusion of SI in first-year freshman experience programs.

The effective design of SI depends on an understanding of the variables influencing academic achievement. In this study, enrollment in a course section with a female faculty member served as a positive predictor of academic success for females and students of color. Representation of males in STEM-related fields far surpasses that of females (Moriarty, 2007; National Science Foundation, 2000, 2004), and representation of ethnic minorities lag significantly behind that of White males (George, Neale, Van Horne, & Malcom, 2001). To meet the needs of a diverse student body, administrators should establish policies and procedures that recruit for and ensure a diverse pool of both adjunct and full-time faculty teaching in STEM-related courses offering SI. Establishing a significant number of females serving as instructors in such programs may increase the chance of success for students associated with a traditionally underrepresented demographic in STEM-related fields.

These same policies and procedures should also aim to ensure a diverse pool of students serving as SI leaders. The results of this study indicated that, for students of color, enrollment in a course section with an SI leader who was also a student of color predicted an increase in both final course grade and final cumulative GPA. This suggests that the benefits of participation in a course with an SI leader who is a student of color extend beyond the single class in which the student enrolled. Students generally view SI leaders as peer mentors (Congos & Schoeps, 1998) and underprepared students benefit from dialogue with prepared students (Martin et al., 1996).

For the students in this study, connection with a peer mentor with a similar ethnic background served as a significant predictor of academic success. To effectively serve a diverse population of students, administrators should ensure that the same procedures establishing diversity in the faculty ranks are applied to the selection of student SI leaders. Moreover, these same procedures should be implemented in the selection of students working in other academic support services, such as tutoring and peer mentoring. In addition, including the SI session meeting schedule and the name of the SI leader within the published schedule of classes would provide students with more information when selecting courses targeted for SI. This would allow students to build their class schedule to include participation in SI and to balance their other life responsibilities to accommodate SI participation. This is particularly significant for HSIs that must be sensitive to the needs of their diverse students.

The diverse nature of community college students is reflected in the wide-range of attributes associated with their academic preparation. However, in this study, the predictive value of the math and English assessment scores was relatively weak, even after controlling for the strong influence of prior GPA. These results suggest that assessment scores such as these provide limited information regarding who will be successful in courses offering SI. Institutions within the community college system invest a tremendous amount of time and energy into assessment exams. The results of this study indicate that enrollment in a course section offering SI can be a significant advantage to a student with poor assessment scores. Institutions offering SI should consider this when recruiting, advising, and placing students into freshman-levels courses.

Implications for Future Research and Policy

The results of this study indicate that both academic preparation and student demographics influence the academic achievement of students involved in courses implementing SI in STEM-related fields. The majority of the studies evaluating the impact of SI on academic achievement focus on participation in SI as the sole predictor of academic success. This study sheds light on additional variables associated with participation in SI that should be considered when effectively designing, implementing, and evaluating SI programs in STEM-related fields.

In this study, prior GPA served as a stronger predictor of academic success for males in comparison with females, suggesting that females may be more influenced by interventions than males. Such a speculation is consistent with the finding that there was a stronger influence of the number of SI sessions attended for females in comparison to males. Further mixed-methods studies aimed at evaluating the differential impact, influence, and experience of males and females participating in SI programs are needed. In addition, researchers should design studies aimed at identifying additional variables associated with participation in SI that potentially influence academic success, particularly so with respect to the ethnicity of the SI leader.

Furthermore, the influence of SI leader student of color status should be evaluated to identify potential reasons why this variable selectively enhances academic achievement for females and students of color, a significant finding in this study. Qualitative research evaluating perceived differences in teaching pedagogy or the perceptions of the SI leader as a role model among enrolled students may shed light on the differential impact on academic achievement between males, females, White, and students of color within the community college system.

Regardless of gender and ethnicity, all students in this study experienced enhanced academic achievement as a result of participation in SI, as measured by both final course grade and final cumulative GPA. Yet, the impact was greater for females and students of color. Additional qualitative research should be conducted to provide insight into whether differences in learning strategies, perception of SI leaders as role models, differential impact of studying in a group setting, and participation in dialogue focused on course content exist between students based on gender and student of color status.

Authors' Note

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