

## **Shifting Gears in a Pandemic: The Impact of Online Academic Support for International and Domestic Students**

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### **ABSTRACT**

*During a global pandemic, many students in 2020-2021 turned to peer-facilitated academic support through supplemental instruction (SI) to succeed. In this study, proficient students were hired as SI Leaders and trained to facilitate study sessions in a collaborative virtual learning environment. The impact of online SI support is assessed upon subgroups of 4,793 students enrolled in difficult courses at a four-year public university. Mean course GPAs and pass rates of international students, domestic students of color, and domestic white students with varying levels of SI session attendance were examined. One-way ANOVA and chi-square test results*

*reveal significant differences by level of attendance for students of color and white students, with higher mean course GPAs and pass rates associated with higher levels of attendance at SI sessions for all three subgroups. Results are consistent with feedback from SI attendees and convey the significance of programs like SI, especially in times of crisis.*

**Keywords:** academic support, international students, online, students of color, supplemental instruction

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As industry pivoted to an online context during a global pandemic, so did higher education. This also meant shifting academic support programs such as Supplemental Instruction (SI) online. SI is a form of peer-facilitated academic support in which proficient students are trained with collaborative learning strategies and facilitation skills and with such training, facilitate study sessions for interested students. There is an abundance of evidence that face-to-face SI is effective at boosting course grades (Channing & Okada, 2020; Dawson et al., 2014; Gasiewski et al., 2012; Haak et al., 2011; Im et al., 2019; Oja, 2012; Peterfreund et al., 2007-2008; Rabitoy et al., 2015) and course success rates (Oja, 2012; Peterfreund et al., 2007-2008; Petrucci & Rivera-Figueroa, 2021). However, it is unclear whether *online* SI support was effective in enhancing the course performance of students, especially while many students faced additional pressures due to the pandemic.

Additionally, it is unclear whether online SI support is effective for *all* groups of students. For example, research shows that domestic students of color are less successful in college due to obstacles often associated with their minority status such as lower income, first-generation student status, and segregation (Ishitani, 2003; Reason, 2009; Sanchez & Kolodner, 2021). Students of color may also attend lower-quality schools that do not adequately prepare them for college, and they may feel less confident in their abilities due to prevalent stereotypes (Frye et al., 2021; Massey et al., 2002; Rath et al., 2007) and/or hostile campus climates (Bowman et al., 2021; Hurtado et al., 2012).

Although academic support has been cited as a contributing factor to the success of international students in higher education (Cong & Glass, 2019; Glass et al., 2014; Martirosyan et al., 2019; Zhang & Goodson, 2011), limited English language proficiency and/or different academic cultural norms may interfere with

their success (Jacobi, 2020; Martirosyan et al., 2015). During the pandemic, many international students were also isolated on an empty campus or in their home countries, forced to engage in all school-related communication online and potentially in a different time zone.

In the context of these stressful circumstances, would online SI support be enough to support these marginalized groups of students (i.e., international students and domestic students of color)? The purpose of this study was to assess the impact and perceptions of impact of online SI support upon course GPAs and success rates of international students, domestic students of color, and domestic white students during a global pandemic. Therefore, the following research questions are advanced.

### **Research Questions**

RQ1: How will online SI session attendance frequency impact the final course GPAs of international students, domestic students of color, and domestic white students?

RQ2: How will online SI session attendance frequency impact the percentage of international students, domestic students of color, and domestic white students who succeed (earn a final course grade in the A, B, or C range) in SI-supported courses?

RQ3: What are the perceptions of students regarding the impact of online SI upon their grades and success in the course?

### **Literature Review**

As stated above, there is an abundance of literature, which confirms the significance of SI session attendance upon the course performance outcomes (i.e., course GPAs and success rates) of all students. However, there is much less research that explores a differential impact upon subgroups of students to determine the efficacy of SI for domestic students of color and international students. There is even less research that explores differential impact of *online* SI upon course performance outcomes of subgroups of students. Due to the paucity of research on online SI upon subgroups of students, the literature relevant to the impact of face-to-face SI upon course performance outcomes of subgroups of students is reviewed first followed by the literature that exists on online SI.

### **Impact of Face-to-Face SI on Course Performance Outcomes of Student Subgroups**

### *Students of Color*

Some studies have found a differential impact of face-to-face SI upon students of color (Buchanan et al., 2019; Fresno State University, 2016; Peterfreund et al., 2007-2008; Petrucci & Rivera-Figueroa, 2021; Rabbitoy et al., 2015; Rath et al., 2007; Rath et al., 2011; Shaya et al., 1993; Williams, 2014; Yue et al., 2018). For example, Shaya et al. (1993) assessed the impact of SI upon the final course grades and retention of at-risk students in an Excel program (largely minorities and women) enrolled in a basic biology course at Wayne State University. Despite no significant differences in high school GPA or ACT scores between attendees and non-attendees, *t*-test results indicate statistically significant differences in mean final course GPAs between Excel SI session attendees (2.9) and non-attendees (2.4). Attendees also successfully completed the course at a significantly higher rate (90% versus 32%). Peterfreund et al. (2007-2008) examined the pass rates of students enrolled in SI-supported courses at San Francisco State University. SI attendees performed better in 14 of 15 courses, and there were more significant increases in pass rates for underrepresented minorities. At the same university, Rath et al. (2007) found larger gains among the 101 underrepresented minority student SI attendees in a study of 1,526 biology students (78 students passed vs. an expected 52). Finally, despite small effect sizes, Williams (2014) discovered a stronger positive effect on final course grades of Hispanic, Black, and first-generation SI attendees in science courses at a community college.

Some studies have also conveyed the significance of face-to-face SI in closing the equity gap, or what Yue et al. (2018) refer to as the *achievement gap*, the “gap which exists between disadvantaged and non-disadvantaged students and their mean final course grade in an SI-supported course” (p. 19). For example, after attendance at 16 SI sessions, the equity gap between underrepresented minority students and others nearly closed (.09 difference in mean course grades) in the study conducted at Fresno State University (2016). In Yue et al.’s study, the gap was eliminated with attendance at 16 SI sessions (.96 vs. .63 average grade improvement).

### *International Students*

Research on the impact of face-to-face SI upon international students is limited (Chilvers, 2014; Dancer et al., 2015), but a few studies have found a

positive differential impact. For example, Couchman (1997) found a significant difference in pass rates of international student SI attendees (78%) versus non-attendees (48%) in an accounting course. Similarly, Couchman and Pigozzo (1997) found a significant difference in pass rates of international student SI attendees (93%) versus non-attendees (63%) in an economics course. Examining the websites of the 20 U.S. universities with the highest enrollment of international students, Martirosyan et al. (2019) assessed the academic and social support services offered to international students. Findings suggest that academic support is one of the six key forms of support offered in all 20 top enrolling institutions. SI was one of those forms of academic support that helped international students to succeed. Finally, Dancer et al. (2015) compared the impact of PASS (Australian version of SI) upon the course grades of international and local students in a business statistics course in 2006 and 2010. Course averages for local and international PASS participants exceeded non-participants in both years, revealing that PASS had a significant impact regardless of country of origin. However, international students experienced larger grade increases with attendance at each PASS session (1.12 and .98 vs. .81 and .79). These studies provide evidence of positive impact for international students. However, the research is limited to individual courses.

There is also some research that explores international student perceptions of peer-facilitated support. For example, Chilvers (2014) conducted a thematic analysis of interview transcripts of 3 international student PASS participants and found that PASS offered both academic and social support. In a study using self-perception survey results of 16 international postgraduate PASS attendees and interview data from 4 of those students, Zaccagnini and Verenikina (2013) found that PASS helped students to improve their grades, English skills, and understanding of course content, helped them to meet others, and boosted their motivation, self-regulation, study skills, and confidence with class participation.

Although these studies convey significant benefits for international students, they were based on small samples, and in the case of Zaccagnini and Verenikina, based upon the perceptions of postgraduate international students, not undergraduates. Additionally, these studies explore the impact of *face-to-face* SI; it is possible that online SI leads to different outcomes.

### **Impact of Online SI on Course Performance Outcomes of All Students**

Like face-to-face SI, online SI is associated with higher course grades and better pass rates for SI-session attendees than non-attendees (Finlay & Mitchell, 2017; Hizer et al., 2017; Miller, 2006; Ndahi et al., 2007; Pereira, 2012; Rockefeller, 2003; Rowe, 2019; Spaniol-Mathews et al., 2016; Woolrych et al., 2019). For example, after randomly assigning students to a face-to-face or online SI group, Hizer et al. (2017) compared the impact upon course grades and success rates. Findings suggest similar results for both forms of SI, with attending students receiving higher final course grades (average increase of .5) and a 13% decrease in fail rates. Finlay and Mitchell (2017) compared the impact of face-to-face and online SI sessions upon course grades of 350 students enrolled in introductory biology courses as part of the University of Regina's nursing program. Grades improved by 5-6% with attendance at three or more SI sessions, regardless of delivery format.

Woolrych et al. (2019) examined the impact of online and face-to-face delivery of PASS sessions on 169 attendees in an introductory statistics course. Although small sample sizes, there were no significant differences between the mean final grades of online ( $M = 73$ ), face-to-face ( $M = 73.26$ ), or online and face-to-face attendees ( $M = 72.82$ ). Regardless of delivery format, all PASS attendees performed better than non-attendees ( $M = 68$ ). Similarly, Spaniol-Mathews et al. (2016) compared final course grades and persistence of 585 undergraduates in STEM courses who were randomly assigned to face-to-face or online SI at Texas A&M University. They found no statistically significant differences in mean final course grades (1.88 online vs. 1.91 face-to-face) or persistence (92% online vs. 90% face-to-face); in other words, online SI was just as effective as face-to-face SI.

Finally, Carter-Hanson and Gadbury-Amyot (2016) examined the impact of participation in an Admissions Enhancement Program that included mandatory online SI sessions of 48 underrepresented minority and disadvantaged students. Post-Dental Admission Test (DAT) scores were significantly higher ( $M = 17.84$ ) than pre-DAT scores ( $M = 16$ ) following completion of the program. Additionally, 70.8% of the 48 students were admitted to a dental school following participation in the program. However, this study was conducted on a small and specific sample of students, which limits generalizability. Additionally, the SI program was mandatory, so participants attended all sessions and impact by varying levels of attendance was not examined.

The results of these studies are promising since they suggest that online SI is just as effective as face-to-face SI. However, only one study (Carter-Hanson & Gadbury-Amyot, 2016) examined impact upon subgroups of students, differentiated by country of origin or race. Furthermore, none of these studies examined differences by varying levels of attendance, which should be “factored into associated analyses so that questions of minimal and optimal treatment dosage might be effectively addressed” (Spaniol-Mathews et al., 2016, p. 27).

In summary, there are gaps in the research on online SI. Some studies have found a difference in the impact of *face-to-face SI* upon the performance outcomes of students of color, but there are less studies of international students. Other studies have found that online SI produces similar outcomes to face-to-face SI, resulting in better course grades and pass rates for all students collectively. However, a thorough review of the extant literature revealed no studies that examine differential impact of *varying levels of online SI attendance upon subgroups of students by citizenship and/or race*. The aim of this study was to fill these gaps in the literature.

## Method

### Recruitment & Data Collection

This study focuses on a particular aspect of the overall examination of the MavPASS program (their version of SI) at Minnesota State University Mankato (MSUM). MSUM is a regional comprehensive university with approximately 13,000 students. It is a predominantly white institution where approximately 9% of students are international students and 13% are domestic students of color. MavPASS (Maverick Peer-facilitated Academic Support System) was developed on the campus to increase the course success and retention of all students and to close equity gaps.

The data used for this study come from a large database of information from MSUM’s institutional records of the approximately 7,000 students who had taken one or more courses supported with SI Leaders between fall 2019 and spring 2021. Only the student data from the 2020-2021 academic year were used since this study was focused upon the impact of *online SI*, and SI sessions were held exclusively online due to the pandemic in this time frame. The data collection protocol was approved by the institutional review board, and because the data collected from the Office of Institutional Research was deidentified prior to

analysis, a waiver of consent was approved. This educational research is also exempt through the Family Educational Rights and Privacy Act guidelines.

Attendance at online SI sessions was tracked with Google forms. At the end of each semester, the attendance data were entered onto an Excel spreadsheet and sent to the Office of Institutional Research. Final course GPA and demographic information was added for each student, and the data were deidentified and returned to the principal investigator for analysis. To assess whether course performance outcome data coincided with students' perceptions of their performance, SI attendees were also offered the opportunity to share anonymous feedback on the program with a link to a Qualtrics survey emailed to them.

### Participants

In 2020-2021, 4,793 students were offered the opportunity to attend SI sessions *online* due to the pandemic (2,250 students in fall 2020 and 2,543 students in spring 2021). The subgroups of students examined in the study included 547 international students (11.3%), 944 students of color (19.5%), and 3,302 white students (68.3%). An international student was defined on this campus as “a person who is not a citizen or national of the United States and who is in this country on a visa or temporary basis and does not have the right to remain indefinitely (IPEDS). This is reported regardless of racial-ethnic status.” Of the students of color, most were Black (31.9%,  $N = 301$ ), followed by Hispanic of any race (26.1%,  $N = 246$ ), two or more races (20.3%,  $N = 192$ ), Asian (19.9%,  $N = 188$ ), Alaska Native (1.6%,  $N = 15$ ), and Pacific Islander (0.2%,  $N = 2$ ). See Table 1 for the specific breakdown of demographics within subgroups.

The courses supported with SI Leaders were difficult courses with approximately 25% or higher DFW rates [i.e., percentage D, F and W (withdraw grades)]. Most courses were from the College of Science, Engineering, and Technology (CSET) and included classes in biology, anatomy, programming, mathematics, physics, and statistics. Several courses in anthropology, economics, and social statistics from the College of Social and Behavioral Sciences (SBS) were supported. Accounting from the College of Business, and English in Arts and Humanities were also supported. The courses were taught by 40 instructors, and SI sessions were led by 55 leaders, some of whom were instructors and leaders in both semesters.

### Table 1: Demographics

	International ( <i>N</i> = 547)		Students of Color ( <i>N</i> = 944)		White ( <i>N</i> = 3302)	
	<i>n</i>	%	<i>n</i>	%	<i>N</i>	%
<b>Gender</b>						
Female	187	34.2%	407	43.1%	1294	39.2%
Male	357	65.3%	537	56.9%	2004	60.7%
<b>First-generation</b>						
Yes	154	28.2%	511	54.1%	1047	31.7%
No	354	64.7%	423	44.8%	2224	67.4%
<b>College</b>						
CSET (sciences)	297	54.3%	429	45.4%	1197	36.3%
SBS (social sci.)	191	34.9%	353	37.4%	1394	42.2%
COB (business)	58	10.6%	120	13.7%	602	18.2%
Arts & Humanities	1	0.2%	33	3.5%	109	3.3%
<b>SI Sessions Attended</b>						
0 sessions	316	57.8%	581	61.5%	2322	70.3%
1-4 sessions	154	28.2%	243	25.7%	675	20.4%
5-9 sessions	39	7.1%	74	7.8%	166	5%
10/more sessions	38	6.9%	45	4.8%	137	4.1%

### Supplemental Instruction: Traditional vs. Online

Supplemental instruction is a peer-facilitated model of academic support grounded in Vygotsky's (1962, 1978) social learning theories, which claim that people learn through communication and collaboration with others. SI is built on the notion that learning is a social process. The SI Leader, a student who excelled previously in a challenging course, is recruited (with the use of faculty, advisor, and/or other SI Leader recommendations) and hired to support students and to help them achieve success in that same course. Attempts are made by program staff to hire a set of leaders that match the diversity of the student body (e.g., 9% international students, 13% domestic students of color). In fall 2020, 13% of SI Leaders hired were international students and 23% were domestic students of color; in spring 2021, 14% of SI Leaders hired were international students, and 19% were domestic students of color.

SI Leaders are trained in the use of facilitation skills and collaborative learning strategies; they also attend class and communicate regularly with the course professors to identify challenging content. SI Leaders host 2-3 study sessions each week and invite all students to attend (UMKC, 2021).

Traditionally, SI sessions are held in person where SI Leaders may use tangible

items to facilitate learning in a collaborative environment (i.e., whiteboards, post-it notes, or notecards).

Due to the pandemic, SI sessions were facilitated online via Zoom. Online SI poses new challenges since it may be difficult to replicate the in-person SI experience in an online format (Fetner, 2013). Different skills and modifications are required to adapt SI to the online context (Beaumont et al., 2012; Wang et al., 2018). Therefore, SI Leaders were trained to facilitate learning in a collaborative virtual environment without the traditional tangible items. They practiced with Zoom tools such as the virtual whiteboard, screen share, file sharing, reaction tools, polling tool, chat feature, annotation tools, and breakout rooms. They also learned to use alternative tools (i.e., PowerPoint presentations with collective annotation, shared Google docs, Jamboard, Poll Everywhere, Kahoot).

SI Leaders were also trained to use the same facilitation skills they used in face-to-face SI sessions (checking for understanding, redirecting questions, and wait time) to ensure that the onus was on students to work through the material and problem-solve. Finally, to maximize participation of attendees for their academic benefit, SI Leaders were trained on how to encourage active participation and how to create a cameras-on norm in their sessions. Leaders role-played learned skills and conducted mock sessions. SI sessions were recorded and shared with students upon request.

## **Measures & Data Analysis**

### ***RQ 1: Impact of Online SI on Mean Course GPAs of Subgroups of Students***

To test the impact of online SI at varying levels of attendance upon mean course GPA in the three subgroups of students, One-way ANOVAs were performed. The independent variable, SI session attendance, was coded as a categorical variable with four levels (0 sessions, 1-4 sessions, 5-9 sessions, and 10+ sessions) in accordance with the standards set by the International Center for Supplemental Instruction at UMKC. Mean course GPA was a continuous dependent variable. Final course grades were translated by the Office of Institutional Research from letter grades to GPA points, in which pluses increased grades by .33 points and minuses decreased by .33 points [i.e., A (4.0), A- (3.67), B+ (3.33), B (3.0), etc.]. F's were assigned 0 points. W's (withdraws) and I's (incompletes) were not included in the mean course GPA.

Although sample sizes were large enough within each group, they varied significantly across session attendance groups in the white student group. This

resulted in a significant *Levene*  $F(2,2977) = 8.84, p = .000$ , indicating that the homogeneity of variance assumption was not met. To accommodate, the Welch's *F* test for unequal variances, a more robust test of equality of means, was conducted to confirm significance for the white student group (Welch, 1951).

***RQ2: Impact of Online SI on Course Success of Subgroups of Students***

Chi-square tests of independence were performed to examine the relation between SI session attendance and course success for each student subgroup. Course success rates were defined by the percentage of passing students within each subgroup (i.e., percentage of A, B, and C range grades versus percentage of D, F, and W grades). Incomplete grades were excluded from analysis.

***RQ3: Student Perception Data***

A Qualtrics survey was used to assess perceptions of online SI session attendees. With Likert-scale items, attendees were asked to rate the extent to which SI supported them in various ways. One question asked participants to rate how helpful the online SI sessions were on a 10-point Likert scale (1 = not helpful at all; 10 = very helpful). The other scale items requested ratings on a 4-point scale (1 = definitely not; 4 = definitely will) of the extent to which students perceived that SI would help them with future courses, achieve their vision of success, increase their sense of belonging, and increase their likelihood of recommending SI to others. Survey respondents were also given the opportunity to share general qualitative feedback.

## **Results**

***RQ1: Impact of Online SI Session Attendance on Mean Course GPAs***

Three One-way ANOVAs were performed to test the impact of online SI session attendance on course GPAs of international students, domestic students of color, and domestic white students.

***International Students***

Results of the One-way ANOVA by level of SI session attendance were not statistically significant,  $F(3, 517) = 2.37, p = .07$ . However, mean course GPAs were increasingly higher at each level of attendance: 0 sessions ( $M = 2.89, SD = 1.24$ ), 1-4 sessions ( $M = 3.05, SD = 1.07$ ), 5-9 sessions ( $M = 3.18, SD = 1.19$ ), and 10+ sessions ( $M = 3.35, SD = 1.02$ ). An independent samples *t*-test was run to determine if there were significant differences between international students who attended any online SI sessions with those who did not attend at all. A

significant difference was found between groups,  $t(519) = -2.26, p = .02$ , indicating that online SI session attendance had an impact upon course GPAs for international student attendees.

### *Students of Color*

Results of the One-way ANOVA revealed that mean course GPAs differed significantly among the four groups based upon session level attendance,  $F(3, 786) = 3.63, p = .01$ . Mean course GPAs suggest the most significant difference for students of color who attended 10 or more sessions. The course GPAs for students who attended 0 sessions ( $M = 2.43, SD = 1.39$ ) and 5-9 sessions were virtually the same ( $M = 2.42, SD = 1.25$ ), while students who attended 1-4 sessions had a slighter higher mean course GPA ( $M = 2.54, SD = 1.26$ ) and students who attended 10+ sessions shifted from a C to a B average ( $M = 3.11, SD = 1.33$ ). Post hoc comparisons using the Tukey's HSD procedure reveal significant differences only between 10+ SI session attendees and all other groups (see Table 2).

**Table 2: Post Hoc Results for Student of Color Mean Course GPAs by Sessions Attended**

Sessions Attended	Mean	Mean Differences			
		1	2	3	4
1. 0 sessions	2.43	--			
2. 1-4 sessions	2.54	.11	--		
3. 5-9 sessions	2.42	.01	.11	--	
4. 10+ session	3.11	.67*	.57*	.68*	--

\* $p < .05$

### *White Students*

Results of the One-way ANOVA revealed that mean course GPAs differed significantly among the four groups based upon session level attendance,  $F(3, 786) = 12.78, p = .000$ . Because the homogeneity of variance assumption was not met, a Welch's F test was also performed. The test confirmed a statistically significant main effect,  $Welch's F(3, 391) = 22.19, p = .000$ , indicating a significant difference between groups. Mean course GPAs were higher at each category level of attendance for white students: 0 sessions ( $M = 2.82, SD = 1.21$ ), 1-4 sessions ( $M = 2.91, SD = 1.07$ ), 5-9 sessions ( $M = 3.12, SD = .94$ ), and 10+ sessions ( $M = 3.34, SD = .79$ ). Post hoc comparisons were conducted with the Games-Howell procedure to determine which pairs differed significantly. Results

in Table 3 reveal the most significant mean differences in course GPA between non-attendees and regular attendees (especially 10 or more sessions).

**Table 3: Post Hoc Results for White Student Mean Course GPAs by Sessions Attended**

Sessions Attended	Mean	Mean Differences			
		1	2	3	4
1. 0 sessions	2.82	--			
2. 1-4 sessions	2.91	.09	--		
3. 5-9 sessions	3.12	.30*	.21	--	
4. 10+ session	3.38	.56*	.47*	.26	--

\* $p < .05$

### **RQ2: Impact of Online SI Session Attendance on Course Success**

Three chi-square tests of independence were performed to examine the relationship between online SI session attendance and course success of international students, domestic students of color, and domestic white students.

#### ***International Students***

The chi-square test assessing the relationship between online SI session attendance and course success of international students did not reach significance,  $X^2(3, N = 547) = 77.49, p = .075$ . However, the percentage of students who succeeded in the course increased at increasingly higher levels of session attendance. The percentage of students who passed with an A, B, or C range grade increased from 80.1% among non-attendees to 83.8% among attendees of 1-4 SI sessions, to 89.7% among attendees of 5-9 SI sessions, and to 94.7% among attendees of 10+ sessions. Conversely, the percentage of students who earned a D, F, or W decreased (19.9% for non-attendees, to 16.2% for 1-4 SI sessions, to 10.3% for 5-9 sessions, and 5.3% for 10+ sessions). In other words, the more international students attended SI, the greater their likelihood of success in the course.

#### ***Students of Color***

The chi-square test assessing the relationship between online SI session attendance and course success of students of color was significant,  $X^2(3, N = 943) = 18.81, p = .000, Cramer's V = .141$ . The pattern reveals increasing levels of course success with increased frequency of SI session attendance. The percentage of students of color who passed with an A, B, or C increased from 61.6% among non-attendees to 68.7% among attendees of 1-4 SI sessions, to 70.3% among attendees of 5-9 SI sessions, and to 91.1% among attendees of 10+ sessions. Conversely, the percentage of students of color who were unsuccessful

decreased (from 38.4% among non-attendees, to 31.3% for 1-4 SI sessions, to 29.7% for 5-9 sessions, and 8.9% for 10+ sessions). In other words, the more students of color attended SI, the greater their likelihood of success in the course. The impact was most prevalent with attendance at 10+ sessions.

An examination of the observed and expected values revealed that there were less successful students (358 versus an expected 381) and more unsuccessful students (223 versus an expected 200) in the “0 sessions” group. There were also more successful students than expected and less unsuccessful students than expected in all other groups, indicating a positive impact of online SI attendance upon course success. For example, only 4 (vs. an expected 16) 10+ attendees failed or withdrew, and 41 (vs. an expected 29) 10+ attendees passed. In summary, more student of color SI session attendees than expected passed the course while less student of color non-attendees than expected passed the course.

### ***White Students***

The chi-square test assessing the relationship between online SI session attendance and course success of white students was significant,  $X^2(3, N = 3300) = 41.19, p = .000, Cramer's V = .112$ . Again, the pattern reveals increasing levels of course success with increased frequency of SI session attendance. The percentage of white students who passed with an A, B, or C increased from 77.6% among non-attendees to 81.9% among attendees of 1-4 SI sessions, to 89.2% among attendees of 5-9 SI sessions, and to 96.4% among attendees of 10+ sessions. Conversely, the percentage of white students who were unsuccessful decreased (from 22.4% among non-attendees, to 18.1% for 1-4 SI sessions, to 10.8% for 5-9 sessions, and 3.6% for 10+ sessions). In other words, the more that white students attended SI, the greater their likelihood of success.

An examination of the observed and expected values revealed that there were less successful students (1802 versus an expected 1854) and more unsuccessful students (520 versus an expected 468) in the “0 sessions” group. There were also more successful students than expected and less unsuccessful students than expected in all other groups, again indicating a positive impact of SI attendance upon course success for white students. For example, only 5 (vs. an expected 28) 10+ attendees failed or withdrew, and 132 (vs. an expected 109) 10+ attendees passed. In summary, more white SI session attendees than expected passed the course while less white non-attendees than expected passed the course.

Chi-squares were significant for students of color and white students. See Table 4 for percentages of students who passed per session attendance frequency within each subgroup.

**Table 4: Percentage of Student Subgroups who Succeeded by SI Session Attendance Frequency**

	Sessions Attended				All Students
	0 sessions	1-4 sessions	5-9 sessions	10+ sessions	
International Students (N = 547)	80.1%	83.8%	89.7%	94.7%	82.8%
Students of Color (N = 943)	61.6%	68.7%	70.3%	91.1%	65.5%
White Students (N = 3300)	77.6%	81.9%	89.2%	96.4%	79.8%

### **RQ3: Student Perceptions of Online SI**

Of the 1,571 online SI attendees, 255 (16.2%) completed the Qualtrics survey. To ensure that students gave honest feedback, no demographic information was collected. Unfortunately, this did not allow for comparison of student perceptions between subgroups of students.

Student perception data are consistent with course performance outcomes. On a scale of 1-10 with 10 being “very helpful,” the average extent to which attendees found SI helpful was 8.02. Additionally, most (90.2%) claimed that online SI “contributed in some way” or “definitely contributed” to helping them to achieve their vision of success. The majority (89%) also perceived that SI was “likely to help” or “definitely will help” them to do well in future courses. Most students (65.9%) felt that SI helped them to have a “slightly stronger” or “definitely stronger” sense of belonging on the campus. Finally, nearly all attendees (93.3%) were “probably” or “definitely” likely to recommend online SI to others taking SI-supported courses.

Qualitative comments suggest that online SI helped students to achieve success in the course in the same way that face-to-face SI helped them. There were consistent references to students’ belief that they would not have passed the class without the support of MavPASS. One student made specific reference to the need for academic support in the context of the pandemic: “With this COVID

learning space some of the information was hard to learn in class and the MavPASS sessions really helped me understand the material, and I believe they were a driving force for me passing the class.” Another student conveyed a sense of frustration with the fact that they found it *necessary* to rely on academic support to understand the course material:

My opinion of the COVID version of MavPASS isn't really as indicative of the quality I experienced when they were in person . . . MavPASS should be seen as additional help, not as the one and only resource to help us with the class . . .

MavPASS ended up being more of a primary source of information.

Although this student seemed grateful to have had a resource upon which to rely, they also expressed disappointment with the “COVID version of MavPASS” compared to the “quality experienced . . . when they were in person.” Because the student does not elaborate, it is unclear what made the face-to-face sessions better “quality.” It is possible that the student missed atmospheric elements of face-to-face sessions that allow for human connection.

Some students directly explored atmospheric elements of SI sessions. For example, one student missed the face-to-face format of the previous year and requested in-person sessions again to enhance the “experience as a whole.” Other students made note of the efforts of their leader in creating a welcome environment. One attendee said, “I always attended MAVPASS with [SI Leader] and he was always SOOOO welcoming and inclusive.” A final student referred to the community atmosphere despite the virtual context: “With Zoom it's tough to get to know people, but with a smaller MavPASS, I got to hear other people speak a little more. . . it was a slightly more relaxed atmosphere.” In summary, students found both academic and social benefits to online SI, which coincides with the success they achieved.

## Limitations

There are a few limitations to consider. First, although the study explored the impact of online SI, the exploration occurred without a face-to-face SI control group under the circumstances surrounding the pandemic. However, the impact of online SI upon three student subgroups offered interesting comparisons. Second, SI session attendance was not treated as a continuous variable but rather by categories of increasing levels of attendance; if treated as a continuous variable, additional subtle differences might have been found. Finally, because demographics were not collected along with the student perception data, it was

impossible to determine if there were differences in perceptions by student subgroups.

### **Discussion**

Results of this study are consistent with findings of previous studies, which convey the impact of online SI upon course grades and success of all students (Finlay & Mitchell, 2017; Hizer et al., 2017; Miller, 2006; Ndahi et al., 2007; Pereira, 2012; Rockefeller, 2003; Rowe, 2019; Spaniol-Mathews et al., 2016; Woolrych et al., 2019). The results also add to the current body of research by clarifying impact upon student subgroups at varying levels of attendance. The mean course GPAs and course success rates of international students, students of color, and white students increased as SI session attendance increased, with the most significant impact revealed when comparing non-attendees with students who attended 10+ sessions. However, there are important considerations when examining the specific findings. The performance level of international students is promising given the circumstances surrounding the pandemic, and the lower baseline for students of color is disconcerting and conveys the significance of regular attendance at SI in closing the equity gap.

Of all three subgroups, international students had the highest course means at all levels of SI session attendance. Additionally, more international students succeeded (82%) than white students (79.8%) or students of color (65.5%), regardless of their level of attendance. In fact, international students had the highest success rates of all three subgroups at every session level category except 10+, at which point they were a close second to white students (94.7% vs. 96.4%). Considering the stressful circumstances international students faced during COVID, this is surprising. There are a number of possibilities for their higher levels of success. First, sometimes financially supported by their home countries, international students may come more prepared for college than their domestic peers. Despite the stressful circumstances, this preparation likely helped them to succeed. Second, MSUM provides a strong support network for international students with a Center for English Language Programs and the Kearney International Center, which provides advising, student programming, and other resources. This confirms previous evidence that academic and social support services are important to international student success and matriculation (Cong & Glass, 2019; Glass et al., 2014; Martirosyan et al., 2019).

In addition to the availability of SI support, international students at this university are highly integrated into the SI program since many international students are hired as SI Leaders. Program staff attempt to hire a diverse group of leaders that at least matches the diversity of the student body. Despite the fact that international students represent just 9% of the student body, in fall 2020, 13% of SI Leaders hired were international students while in spring 2021, 14% of leaders were international students. Such employee representation helps to ensure that international student SI attendees feel represented and welcomed at sessions and likely contributed to the higher attendance levels of international students (37% in fall 2020 and 46% in spring 2021), which were higher than those of white students (29% and 31%) and students of color (37% and 40%).

Finally, the SI sessions were recorded and shared with any students who requested them. Requests often came from international students who lived in different time zones or who wanted to re-watch the sessions for extra practice. In fact, requests were disproportionately from international students with 49 of the 91 requests made for Zoom recordings of SI sessions made by international students (54%) in fall 2020 and 48 of the 171 requests (28%) made by international students in spring 2021. Overall, that means that 37% of the requests came from international students despite the fact that they represent just 9% of the student body and 11% of the students enrolled in the courses in this study. The extra level of support from recordings likely contributed to their success.

Although SI clearly has a stronger impact with increasingly higher levels of attendance for all students, international students ( $M = 2.89$ ) and white students ( $M = 2.82$ ) started at a higher baseline than students of color ( $M = 2.43$ ). Therefore, students of color showed more significant gains with frequent attendance at SI sessions (.68 gain vs. .52 for white students and .46 for international students). In other words, the equity gap closes as SI session attendance increases. Calculated at MSUM by dividing the course GPA of white students from the course GPA of students of color, the equity gap is .867 for non-attendees (2.43/2.82) and .93 for 10+ attendees (3.11/3.34). With a 1.0 representing no gap in performance, clearly, frequent SI session attendance helped to close the gap. This finding is consistent with the findings of previous research that revealed a closing or eliminated gap with attendance at 16 SI sessions (Williams, 2014; Yue et al., 2018). Additionally, consistent with the findings of other studies (Fresno State University, 2016; Rabitoy et al., 2015), the

data reveal the importance of encouraging regular attendance, especially in supporting students of color.

Online SI had a positive impact on the course grades and success of all student groups, especially with increasing attendance. The student perception data suggest that it was not simply the academic support that contributed to student success. Some students made comments pertaining to the welcoming nature of their SI Leaders and the community built within their sessions, and over 65% of students rated the sessions as contributing to their sense of belonging on the campus. The academic and social support of SI, regardless of context, speak to the significance of both academic and social integration of students, which is supported in previous research (Cong & Glass, 2019; Glass et al., 2014). In fact, Cong and Glass (2019) found that *educational service augmenters* (i.e., academic and social support services) and traditional predictors of academic adjustment (which included welcoming attitudes towards international students) together explained 68% of the variance in the academic adjustment of international students. According to sociology scholar Tinto (2021), academic and social integration can occur when educators help to foster students' self-efficacy and their sense of belonging. In other words, students can succeed with encouragement and positive reinforcement. Tinto also asserts that students' presence must be valued rather than tolerated, and their voices perceived as contributing to the dialogue of learning. SI offers the space for such inclusivity and cooperative learning since it encourages active participation of all members regardless of delivery format.

### **Conclusion**

Online SI contributes to the academic success of all subgroups of students, but students of color have a lower baseline mean course GPA than white students and international students, contributing to large equity gaps without academic support. Increasing levels of SI session attendance help to close equity gaps and lead to increasingly positive perceptions of students. Therefore, academic support programs may wish to consider intentional ways to attract students to SI along with ways to foster their academic and social integration.

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