The Impact of Supplemental Instruction on the SI Leader

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Abstract

While the impact of Supplemental Instruction (SI) on the SI Leaders themselves has long been thought to be positive, few studies have directly addressed the effects of the experience of leading an SI workshop. This study, conducted at California State University, Fullerton, attempted to examine this impact quantitatively using a larger data set than previous studies. Subgroups studied included the sex of the SI Leaders, their first generation status and their underrepresented minority (URM) status. While differences in sex or URM status did not significantly correlate to differences in academic background and achievement, several significant differences emerged. Results showed that a higher proportion of men than women reported increased confidence and effectiveness in communicating with professors, peers, and students. Additionally, URM SI Leaders reported increases at a greater rate than their non-URM counterparts in their ability to effectively handle student conflict and communicate with peers. This information may help inform the context of the structure of Supplemental Instruction programs and the training of SI Leaders to better benefit them as well as the SI students.

Background

California State University, Fullerton (CSUF) is a large regional university of over 38,000 students in southern California. CSUF began its SI program in 2007 with two sections of a calculus workshop and two sections of a biology workshop. Based on the SI model of the University of Missouri-Kansas City (UMKC), the CSUF SI program uses peer-led workshops to facilitate the learning process. At CSUF, the goal of implementing an SI program was to reduce the achievement gap for URM students in STEM courses. (We

define URM as students who self-identify as Black, Hispanic, Native American, or multiple races. At CSUF, URM students make up almost 40% of the student body, including 37.4% Hispanic, 2.1% Black, 0.1% Native American, and 4.2% multiple races.) There is evidence that the SI program at CSUF is successful in helping to reduce the achievement gap for URM students in first-year calculus, especially for transfer students (Bonsangue et al., 2013). The SI program at CSUF has since grown to become one of the largest in the United States. In Fall 2015, CSUF's SI program had 130 SI Leaders that were linked to 164 course sections across 13 departments, including departments in business, liberal arts, humanities and STEM disciplines. (Some SI Leaders are linked to more than one course section.) Many studies (Arendale, 2016; Dawson, van der Meer, Skalicky, & Cowley, 2014; Peterfreund, Rath, Xenos, & Bayliss, 2007; Barlow & Villarejo, 2004; Martin & Arendale, 1993) confirm the positive effects of SI workshops on SI participants, especially URM students, in terms of increased passing rates and improved grades.

The effects of leading a workshop on the SI Leader are less concrete, because there are no statistics such as "passing rate" as there are for students in SI-linked courses. However, in several studies, SI Leaders reported overall growth in areas such as effective communication, self-confidence, and professional development. In a meta-analysis of several studies, Stout and McDaniel (2006, p. 55) stated, "Leaders report academic improvement, increased communication and relationship-building skills, and personal and professional development," and that students who engage with SI as a Leader "make the experience of attending college more positive ... and this in turn increases their sense of self, enabling them to strive to meet their personal, professional, and academic goals." Furthermore, "When SI Leaders are carefully selected and trained, they experience many unforeseen benefits. Such benefits include increased understanding of the course material, improved communication skills, and enhanced interactions with faculty, students, other SI Leaders, and SI staff." (2006, p. 56)

Lockie and Van Lanen (2008, p. 10) reported that SI Leaders experienced growth in several areas, including "improved leadership, communication skills and self-confidence as a result of their SI experience." SI Leaders also reported developing better academic and personal habits. In addition, Zaritsky (2006, p. 28) found that "ninety-eight percent of SI leaders reported that being an SI leader helped them gain self-confidence. SI gave them the opportunity to strengthen their leadership and communication skills."

In an evaluation of the SI program at Murdoch University, tutors (SI Leaders) were overwhelmingly enthusiastic in what they learned or gained from participating in the program (Beasley, 1997). Tutors felt an increase in their own confidence and a greater sense of self worth from doing something meaningful for someone else. Furthermore, they reported greater insights about teaching and the value of discussion. Beasley (1997, p. 30) wrote, "For both tutors and tutees there was an increased awareness for a number of them of the value of discussing their views and ideas with their peers."

More recent studies have examined the benefits to SI Leaders in a quantitative way. James and Templeman (2015) studied the emotional intelligence of SI Leaders using the Bar-On Emotional Quotient Inventory (Bar-On, 2004), and found that more effective Leaders tested higher on Social Responsibility, Impulse Control, and Reality Testing. However, the only score that increased significantly in pre/post testing for all Leaders was Problem Solving. In a case study of SI Leaders in an engineering program in Sweden, Malm, Bryngfors, and Morner (2012) gave a Likert-item questionnaire to 35 SI Leaders. This study found that the SI Leaders reported improved communication skills, interpersonal skills, leadership skills, self-confidence, and a deeper understanding of course content. However, there was not a consensus among the Leaders that the experience of leading an SI workshop led to better study skills or time-management skills, in contrast to other studies.

In this study, we used an instrument similar to, but not based on, that used by Malm, et al. (2012) to investigate the effects of leading an SI workshop on communication skills, leadership skills, and professional growth. In addition, we examined the differences in SI Leaders who identify themselves as non-URM, URM, male, and female. Our research questions were the following:

- Do SI Leaders believe that the experience of leading a semester-long SI workshop section had effects on their career choices, communication skills, leadership skills, and/or conceptual knowledge?

- Are there significant differences in reported effects between URM and non-URM SI workshop Leaders, or between male and female SI workshop Leaders?

Methods

In this study, we asked SI workshop Leaders about their self-perception of the effects of leading a semester-long SI workshop section. (From here on, we will simply use the term "workshop" to refer to a semester-

long workshop section.) To do so, we created an anonymous questionnaire in Google Forms containing twenty-six questions. The questionnaire started with background questions about the SI Leader's gender, ethnicity, parents' level of education, and other demographic information, followed by Likert-scale questions asking about the effect that leading a workshop had on him/her. The Likert-scale questions focused on communication skills, leadership skills, and professional growth (see Table 1).

Table 1

SI Leader Survey

Question					
Being an SI Leader …	1=Strongly Disagree	2=Disagree	3=Neutral	4=Agree	5=Strongly Agree
Q12 has had a strong influence on my career choice.	1	2	3	4	5
Q13 has positively influenced my communication skills.	1	2	3	4	5
Q14 has improved my leadership skills.	1	2	3	4	5
Q15 I have become more aware of campus resources.	1	2	3	4	5
Q16 has taught me skills that have improved other areas of my life.	1	2	3	4	5
Q17 has helped me deal with student conflict.	1	2	3	4	5
Q18 has helped me become more effective when communicating with professors.	1	2	3	4	5
Q19 has helped me become more effective when communicating with peers.	1	2	3	4	5
Q20 has helped me become more effective when communicating with students.	1	2	3	4	5
Q21 has helped me deepen my understanding of core concepts.	1	2	3	4	5

The questionnaire was e-mailed to 153 SI Leaders who led workshops between 2009 and 2013 at CSUF.

The survey was conducted in the fall of 2013 and had a 58% response rate. The majority of the Leaders were from the College of Natural Sciences and Mathematics and led workshops in STEM fields. Table 1 shows ten Liker-scale questions (items 12 through 21) in which SI Leaders were asked about the effects of leading a workshop. Each item had five possible responses, where 5 corresponded to Strongly Agree and 1 corresponded to Strongly Disagree. The questions relating to demographic information are not listed in Table 1.

Results

Percentage of Responses

We examined and compared the percentage of respondents who responded with Disagree or Strongly Disagree (1 or 2), Neutral (3), or Agree or Strongly Agree (4 or 5). We found that a majority of SI Leaders responded Agree on every item (Table 2), although the majority did not always consist of the same participants. Almost all participants felt their communication skills were positively influenced (94.3%, Q13), felt an increase in the effectiveness of their communication skills with students (96.6%, Q20), and felt a deeper understanding of core concepts (97.7%, Q21). A large majority felt they had improved their leadership skills (87.1%, Q14) and skills that improve other areas of life (80.7%, Q16). A smaller group, but still a majority, reported that leading an SI workshop influenced their career choices (51.1%, Q12).

Table 2

Results

SI Leader Survey			
Being an SI Leader …	Disagree (1 or 2)	Neutral (3)	Agree (4 or 5)
Q12 has had a strong influence on my career choice.	17.0%	21.6%	51.4%
Q13 has positively influenced my communication skills.	0%	5.7%	94.3%
Q14 has improved my leadership skills.	1.2%	11.8%	87.1%
Q15 I have become more aware of campus resources.	17.0%	23.9%	59.1%
Q16 has taught me skills that have improved other areas of my life.	5.7%	13.6%	80.7%
Q17 has helped me deal with student conflict.	14.9%	23.0%	62.1%
Q18 has helped me become more effective when communicating with professors.	10.2%	11.4%	78.4%
Q19 has helped me become more effective when communicating with peers.	11.4%	11.4%	77.3%
Q20 has helped me become more effective when communicating with students.	0%	3.4%	96.6%
Q21 has helped me deepen my understanding of core concepts.	0%	2.3%	97.7%

Of particular note was the fact that an overwhelming majority of participants agreed that the experience of leading an SI workshop had a positive effect on their communication skills (Q13, 94.3%) and their effectiveness in communicating with students (Q20, 96.6%). While this is somewhat expected, since the SI Leaders interact with students to a great degree, it is encouraging that so many SI Leaders agreed that their communication skills, especially with students, were positively affected by the experience.

Comparison of Subgroups of Participants

We compared subgroups of participating SI Leaders to determine if there were any significant differences in their responses. We compared respondents who identified themselves as female or male, first generation student or non-first generation student, and URM or non-URM. We first compared those who identified themselves as female and male. For each pair of subgroups, we report the median response to each questionnaire item in Table 3 using the Mann-Whitney U-test to evaluate the differences in responses on each item. We chose to use the Mann-Whitney U-test due to the fact that the Likert-scale data are ordinal and that the data is heavily skewed towards responses of 4 or 5, meaning that we could not assume that the data is normally distributed. Mann-Whitney's U-test provides a better test of statistical significance in this situation than the more common t-test.

Table 3

Median Responses of Female and Male
Participants

SI Leader Survey				
Being an SI Leader …	Female (N=44)	Male (N=43)	U	p-value
Q12 has had a strong influence on my career choice.	4	4	890	0.6254
Q13 has positively influenced my communication skills.	5	5	796	0.1209
Q14 has improved my leadership skills.	4	5	745	0.0581
Q15 I have become more aware of campus resources.	4	4	792	0.1776
Q16 has taught me skills that have improved other areas of my life.	4	5	864	0.4451
Q17 has helped me deal with student conflict.	4	4	848.5	0.3893

Q18 has helped me become more effective when communicating with professors.	4	5	731.5	0.0485*
Q19 has helped me become more effective when communicating with peers.	4	5	801.5	0.1858
Q20 has helped me become more effective when communicating with students.	4	5	694	0.01331*
Q21 has helped me deepen my understanding of core concepts.	5	5	780	0.0748

* indicates significance at the $p < 0.05$ level

In Table 3, we report the median responses of female and male participants to each question. When we ran a Mann-Whitney's *U*-test to evaluate the differences in responses on each item, significant differences between the two groups were found in the responses to Q18 ($U=731.5$, $p<0.05$) and Q20 ($U=694$, $p<0.05$). We detail these two items in Table 4. Females were more likely than males to simply agree, rather than strongly agree, with Q18, and males were more likely than females to strongly agree with Q20.

Table 4

Median Responses of Female and Male Participants

SI Leader Survey						
Being an SI Leader …	Population	1	2	3	4	5
Q18 has helped me become more effective when communicating with professors.	Female (*N*=44)	2.3%	11.4%	15.9%	29.5%	40.9%
	Male (*N*=43)	2.3%	4.7%	6.7%	25.6%	60.5%
Q20 has helped me become more effective when communicating with students.	Female (*N*=44)	0%	0%	4.5%	50.0%	45.5%
	Male (*N*=43)	0%	0%	2.3%	25.6%	72.1%

In Table 5 (below), we report the median responses of first generation and non-first generation participants to each question. The Mann-Whitney's *U*-tests found no significant differences between the two groups.

Table 5

Median Responses of First-Generation
and non-First Generation Participants

SI Leader Survey				
Being an SI Leader …	First Gen (*N*=35)	Non-First Gen (*N*=53)	*U*	*p*-value
Q12 has had a strong influence on my career choice.	4	4	1043	0.3093
Q13 has positively influenced my communication skills.	5	5	933	0.9583
Q14 has improved my leadership skills.	5	5	883	0.6755
Q15 I have become more aware of campus resources.	4	4	980.5	0.6432
Q16 has taught me skills that have improved other areas of my life.	4	5	822.5	0.3244
Q17 has helped me deal with student conflict.	4	4	1136	0.06417
Q18 has helped me become more effective when communicating with professors.	5	5	829.5	0.3656
Q19 has helped me become more effective when communicating with peers.	5	4	947	0.8612
Q20 has helped me become more effective when communicating with students.	5	5	859.5	0.5038
Q21 has helped me deepen my understanding of core concepts.	5	5	777.5	0.1048

In Table 6 (below), we report the median responses of URM and non-URM participants to each question. When we ran a Mann-Whitney's *U*-test to evaluate the differences in responses on each item, significant differences between the two groups were found in the responses to Q12 (*U*=932, *p*<0.01), Q15 (*U*=837.5, *p*<0.05), and Q17 (*U*=845, *p*<0.05). We examine these three items in more detail in Table 7 (below). URM participants were more likely to strongly agree with all three of these statements than non-URM participants.

Table 6

Median Responses of UMR and non-URM Participants

SI Leader Survey				
Being an SI Leader …	URM (*N*=26)	Non-URM (*N*=50)	*U*	*p*-value
Q12 has had a strong influence on my career choice.	5	3.5	932	0.0014*
Q13 has positively influenced my communication skills.	5	5	722	0.3358
Q14 has improved my leadership skills.	5	5	738.5	0.2804
Q15 I have become more aware of campus resources.	4.5	4	837.5	0.0331*
Q16 has taught me skills that have improved other areas of my life.	5	5	705	0.5025
Q17 has helped me deal with student conflict.	5	4	845	0.0252*
Q18 has helped me become more effective when communicating with professors.	5	5	695	0.5887
Q19 has helped me become more effective when communicating with peers.	5	4	810	0.0559
Q20 has helped me become more effective when communicating with students.	5	5	711.5	0.4355
Q21 has helped me deepen my understanding of core concepts.	5	5	691	0.5751

* indicates significance at the *p*<0.05 level

Table 7

*Median Responses of
URM and non-URM Par-
ticipants*

SI Leader Survey						
<u>Being an SI Leader …</u>	Population	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
Q12 has had a strong influence on my career choice.	URM (*N*=26)	0%	3.8%	11.5%	30.8%	53.8%
	Non-URM (*N*=50)	10.0%	14.0%	26.0%	26.0%	24.0%
Q15 I have become more aware of campus resources.	URM (*N*=26)	3.8%	3.8%	19.2%	23.1%	50.0%
	Non-URM (*N*=50)	10.0%	8.0%	22.0%	38.0%	22.0%
Q17 has helped me deal with student conflict.	URM (*N*=26)	0%	0%	26.9%	15.4%	57.7%
	Non-URM (*N*=50)	6.0%	12.0%	24.0%	26.0%	32.0%

Discussion and Conclusion

In response to each question, a majority (sometimes an overwhelming majority) of SI Leaders reported that they either agree or strongly agree that their experiences as SI Leaders positively impacted their communication and leadership skills (Q13, Q18, Q19, Q20, and Q14). We found that almost all participants in the study felt a positive influence on communication skills (Q13), and a large majority felt an improvement in leadership skills (Q14) and other skills (Q16). These results confirm those of Malm, et al. (2012). However, in contrast to that study, our study also found that a slight majority felt that leading an SI workshop impacted their career choice (Q12). Furthermore, participants felt an overall increase in effectiveness in communication skills with professors (Q18) and peers (Q19) and in effectively handling student conflict (Q17).

When comparing subgroups, we found that males were more likely than females to agree that the experience of leading SI sessions helped them with their communication skills with professors and students (Q18 and Q20). We cannot speculate on the reasons why this should be the case, but future research with case studies may shed light on the reasons for this. Likewise, we will not speculate on the reasons why URM participants are more likely to agree that leading an SI workshop had a strong influence on their career choice, helped them to become aware of campus resources, and helped them to deal with student conflict.

However, these results do indicate some areas in which SI supervisors (staff and faculty) can help SI Leaders to gain more from their experience. A perennial problem on many campuses is that students are unaware of campus resources (including Supplemental Instruction). At a very large institution, like CSUF, it is unlikely that students, including SI Leaders, are aware of all of the campus resources available to them. While this study shows that a majority of SI Leaders agreed that they became more aware of campus resources, that majority is still one of the smallest (second only to Q12, influence on career choice), especially for non-URM students. Because SI supervisors work so closely with student SI Leaders, SI supervisors are in a perfect position to introduce other campus resources to the SI Leaders, who can then pass that information along to their students.

These results also indicate that SI supervisors can do more to help female SI Leaders in particular take advantage of leading an SI workshop to develop their communication skills with professors and students. The participants of our study were drawn mainly from STEM fields, where the under-representation of women is a long-standing problem (National Science Board, 2016). It is possible that the results of our study are exaggerated by the fact that a majority of participants led workshops in STEM fields, but it is encouraging to note that there were 44 women and 43 men in this study.

Future Research

Future research could seek to further understand the impact of leading SI workshops on the SI Leader in areas of professional and personal growth. Of special interest are the different effects felt by SI Leaders depending on gender and URM status. Future research may include qualitative research on the SI Leader; conducting a longitudinal study with incoming SI Leaders about how their attitudes change over time; conducting a longitudinal study on incoming SI Leaders' growth in time management, organizational, and professional skills; conducting a longitudinal study on incoming SI Leaders' personality psychology; and researching SI Leaders' backgrounds by looking at their academic records, involvement in on- and off-campus events and organizations, and previous and current professional experiences.

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