

**SUPPLEMENTAL INSTRUCTION AND STUDENT SUCCESS:  
A REPORT ON READING/WRITING LEARNING CENTER SI OUTCOMES IN SPRING 2009**

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**BACKGROUND AND METHODOLOGY**

The Reading/Writing Learning Center (RWLC) at San Joaquin Delta College is a multi-faceted learning center that offers various learning assistance services to students, including:

- Tutoring in content areas
- Tutoring in reading
- Tutoring in writing
- Workshops related to writing, formatting and citing
- Supplemental instruction

The RWLC also houses the College's Reading Lab (Reading 98 and the lab component of Reading 91 series courses) and Writing Lab (English 73A and English 73B) courses. San Joaquin Delta College's Title V grant has funded many services offered at the RWLC since fall 2007, including the center's supplemental instruction (SI) program.

The goals of supplemental instruction services at the RWLC are to:

- support student success in the College's historically difficult general education courses (including social science, business and communication studies) and degree-applicable and gateway English courses, and to
- improve student success, retention and graduation.

Similar to the University of Missouri, Kansas City model, the Delta College SI program requires the recruitment of a previously successful student to sit in on class sessions and provide structured and generally scheduled out-of-class learning assistance to students. Only a limited number of course sections include an SI component, and among those that do offer SI, student participation is completely voluntary. Students who participate in SI may also receive individual or group tutoring at the RWLC and may participate in other learning assistance or support programs such as learning communities if they wish.

The goal of the present study was to examine the impact of supplemental instruction on student success, controlling for other factors. Student success, demographic and academic data were obtained from the College's System 2000 database and were analyzed for students in all courses with SI components. Tutoring and SI session attendance data were obtained from both the College's System 2000 database and the RWLC internal database.

In spring 2009, a total of 13 course sections offered supplemental instruction to enrolled students. SI courses included the following:

- Principles of Accounting (Business 1A)
- Written Communications (English 1A)
- Preparatory English (English 79)
- History of the United States (History 17B)
- African-American History to 1877 (History 30A)
- African-American History since 1877 (History 30B)
- Mexican-American History (History 31)
- Introductory Logic (Philosophy 30)

A total of 891 students enrolled in these sections, accounting for a total of 912 enrollments—21 students were enrolled in two SI-participating courses. Of the 891 students enrolled in these courses, 181 (20%) utilized the RWLC's supplemental instruction services. Among those who did participate in SI, the majority (70%) attended two or more one-hour SI sessions during the spring semester. Table 1 provides an overview of spring 2009 SI participation rates by course. As the table shows, SI participation rates varied greatly from course to course, ranging from 3% in Mexican-American History to 54% in History of the United States. It should be noted that about 50% of students enrolled in an SI-participating course were in African American History courses.

*Table 1. SI Participation by Course*

Course	Enrolled		Attended at Least 1 SI Session	
	N		N	%
Business 1A	66		21	31.8%
English 1A	26		8	30.8%
English 79	65		8	12.3%
History 17B	82		44	53.7%
History 30A	173		54	31.2%
History 30B	288		32	11.1%
History 31	74		2	2.7%
Philosophy 30	138		14	10.1%
<i>Overall/ Total</i>	<i>912</i>		<i>183</i>	<i>20.1%</i>

*Note:* Table illustrates duplicated data; 21 students were enrolled in two SI-participating courses

Demographic data were obtained for SI participants and non-participants for comparison purposes. SI participants were generally demographically similar to non-participants in SI courses, with one exception: SI participants were, on average, about three years older than non-participants. A disproportionately large number of students enrolled in SI-participating courses were African American, equaling 26% of students in SI courses, or about two and half times the proportion in the overall student population. This high proportion of African American students may partially be due to the high enrollment in SI-participating African American history courses. Academic goal, history

and assessment data were also obtained for SI participants and non-participants. Table 2a illustrates participant and non-participant demographics, and Table 2b provides academic data (previous GPA, units attempted) for SI participants and non-participants.

*Table 2a. SI-Participating Course Student Demographics by SI Status*

	Non-Participants N=710		SI Participants N=181	
	N	%	N	%
<b>Ethnicity</b>				
African American	179	25.2%	52	28.7%
American Indian/Alaskan Native	8	1.1%	3	1.7%
Asian/Pacific Islander	122	17.2%	30	16.6%
Hispanic	215	30.3%	45	24.9%
White	127	17.9%	36	19.9%
Other/Unknown	59	8.3%	15	8.3%
<b>Gender</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>
Female	391	55.1%	98	54.1%
Male	313	44.1%	83	45.9%
Unknown	6	1.0%	0	0.0%
<b>Age**</b>	<b>M</b>	<b>SD</b>	<b>M</b>	<b>SD</b>
	21.74	6.09	25.02	9.40

\*\*Significant at the 99% confidence level

As the table shows, SI participants were slightly better academic performers than non-participants prior to the spring 2009 semester; contrastingly, about half of the SI participants assessed at the lowest level in writing, versus just 38% of non-participants. In addition, SI participants were more likely than non-participants to receive a Board of Governors fee waiver, a marker for low-income status. SI participants were also more likely than non-participants to participate in a learning community and to complete a Guidance 11 orientation course but were less likely than non-participants to have a goal of transferring to a four-year university.

Table 2b. SI-Participating Course Student Academics by SI Status

Academic Measures	Non-Participants N=710		SI Participants N=181	
	M	SD	M	SD
Previous Cumulative GPA+	2.39	.93	2.55	.90
Units Attempted (Spring 2009)	12.06	3.63	12.01	4.08
Counseling Appointments 2008-09	1.08	1.39	1.27	1.36
RWLC Tutoring Hours*	.01	.16	.29	1.86
Initial Reading Assessment Level	N	%	N	%
Level 1	209	30.9%	49	30.8%
Level 2	372	55.0%	85	53.5%
Level 3	95	14.1%	25	15.7%
Initial Writing Assessment level*	N	%	N	%
Level 1	252	37.7%	78	50.0%
Level 2	260	38.9%	45	28.8%
Level 3	256	23.4%	33	21.2%
Initial Math Assessment level	N	%	N	%
Level 1	205	30.1%	58	34.7%
Level 2	213	31.3%	54	32.3%
Level 3	263	38.6%	55	32.9%
Learning Community Participation+	N	%	N	%
Not in a Learning Community	668	94.1%	164	90.6%
Enrolled in a Learning Community	42	5.9%	17	9.4%
BOGG Fee Waiver Status*	N	%	N	%
Did Not Receive BOG Fee Waiver	394	55.5%	85	47.0%
Received BOG Fee Waiver	316	44.5%	96	53.0%
Guidance 11 Orientation**	N	%	N	%
Did Not Complete Guidance 11	640	90.1%	149	82.3%
Completed Guidance 11	70	9.9%	32	17.7%
Educational Goal*	N	%	N	%
No Transfer	255	35.9%	80	44.2%
Transfer	455	64.1%	101	55.8%

Source: SJDC System 2000 Database

Note: 92% of all students enrolled in SI-participating courses completed the reading assessment; 90% completed the writing assessment, and 93% completed the math assessment.

+Significant at the 90% confidence level

\*Significant at the 95% confidence level

\*\*Significant at the 99% confidence level

Previous research has linked student participation in SI with short and long-term student success and retention (Bowles & Jones, 2003-2004; Ogden, Thompson, Russell & Simons, 2003; International Center for Supplemental Instruction, 2007) and eventual graduation (Bowles, McCoy & Bates, 2008). The present study was intended to measure the effectiveness of SI in increasing short-term student success. To examine overall student outcomes at Delta College by SI participation, a chi-square analysis was conducted with course success, defined as course completion with a grade of C or better, and retention as outcomes of interest. The results of the analysis are

presented in Table 3. Students who participated in SI were significantly more likely to pass the course (76% versus 57%) and to be retained (85% versus 68%).

Table 3. Student Success and Retention by SI Participation

	Enrolled	Successful**		Retained**	
	N	N	%	N	%
Did not participate in SI	729	416	57.1%	499	68.4%
Participated in SI	183	139	76.0%	155	84.7%
<i>Total</i>	<i>912</i>	<i>555</i>	<i>60.9%</i>	<i>654</i>	<i>71.7%</i>

\*\*Significant at the 99% confidence level

These results, while positive, present only a preliminary analysis of the short-term outcomes of supplemental instruction. Much of the literature pertaining to the effectiveness of SI has relied on simple descriptive or basic inferential statistics like those illustrated in Table 3; however, these analyses do not take into account other factors related to student success, nor do they account for the possibility of self-selection bias. More recent studies of the effectiveness of SI have attempted to measure the unique contribution of SI to positive student outcomes by developing multivariate models of student success, retention and graduation. These models often employ student course grade or GPA as the short-term outcome variable and include previous academic performance, gender, and college entrance exam scores as covariates with SI session attendance (Bowles & Jones, 2003-2004; Ogden et al, 2003; Congos & Schoeps, 1999-2000).

In order to determine if supplemental instruction participation was a predictor of student success at Delta College controlling for other factors, a logistic regression equation was utilized. Student success, defined as passing a course with a grade of C or better, served as the outcome of interest. A total of 794 students were included in the logistic regression model. The remaining 118 students were missing data for one or more of the variables included in the model. Because sample sizes at the course level were rather small, all courses were included in the same regression model, and one variable was added to distinguish social science courses from other courses. Previous studies of learning assistance and student services programs have linked several factors to student success, including demographic factors, unit load, and participation in other services and programs, such as EOPS, counseling and tutoring. Several factors were included in preliminary analysis for the current study, but just six variables emerged as significant predictors of student success, including:

- Gender
- Previous cumulative GPA
- Low-income status
- Unit load
- Course type (social science or not)
- Number of SI sessions attended

Interestingly, total hours of tutoring received was not a significant predictor of success. Descriptive statistics and coding schemes for each variable in the final regression model are provided in Table 3a.

Table 4a. Descriptive Statistics for Variables in the SI Logistic Regression Model

Group	Range of Scores/Coding Scheme	Mean	SD
Gender	Male=0 Female=1	.56	.50
Previous cumulative GPA	0.00 to 4.00	2.44	.92
Low-income status (BOG fee waiver)	Not low income=0 Low income=1	.46	.50
Unit load	3 to 25	12.32	3.70
Social Science Course	0=Not Social Science 1=Social Science	.82	.38
SI sessions attended	0 to 39	1.00	3.39
Success	0=Not successful; 1=Successful	.62	.49

Table 4b presents coefficients, standard errors and odds ratios for each predictor in the model.

Table 4b. Logistic Regression for Success in SI-Participating Courses

Predictor	B	Standard Error	Odds Ratio
<i>Constant</i>	<i>-3.458</i>	<i>.443</i>	<i>.032</i>
Gender*	.353	.164	1.424
Previous cumulative GPA**	.613	.091	1.847
Low-income status**	-.423	.161	.655
Unit load**	.130	.024	1.139
Social Science Course**	.998	.208	2.713
SI sessions attended*	.110	.036	1.116

\*Significant at the 95% confidence level

\*\*Significant at the 99% confidence level

Negative 2 Log Likelihood Ratio	925.057
Model Chi Square	130.721
Percent of Cases Correctly Predicted	69.4%
Proportional Reduction in Error	20.0%
Nagelkerke R <sup>2</sup>	.206

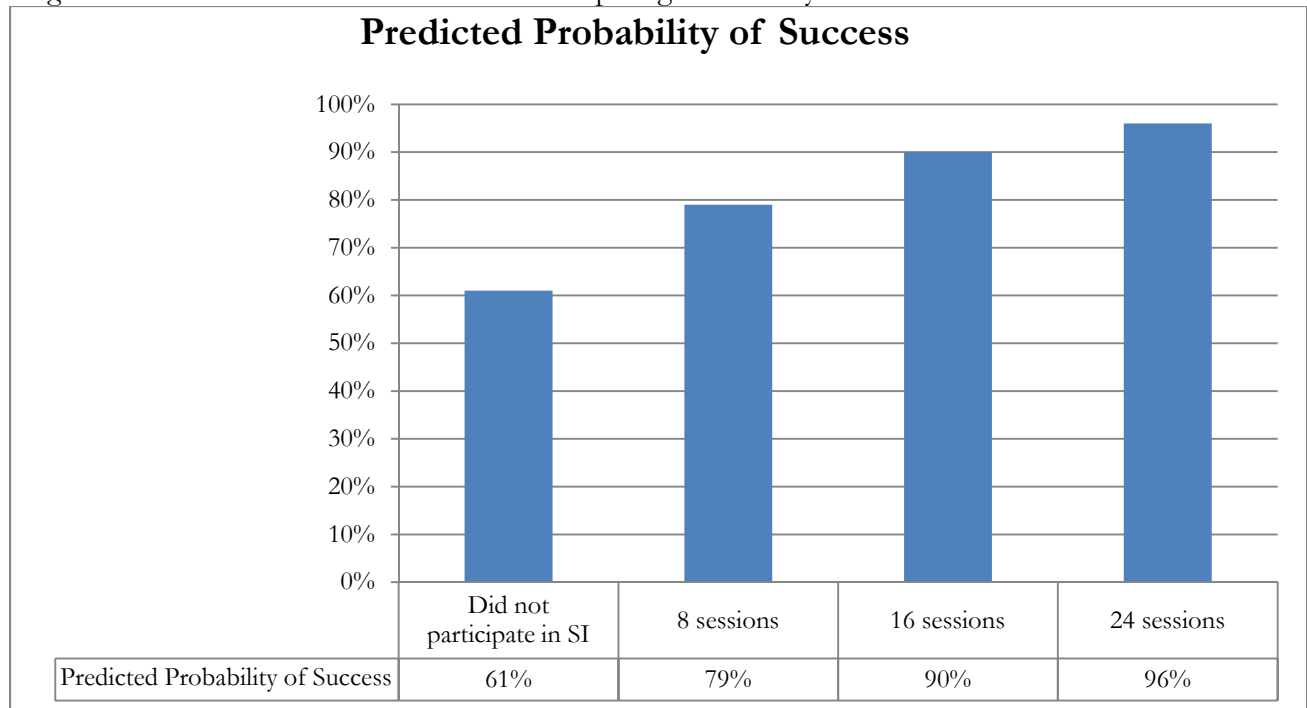
The final regression model resulted in a proportional reduction in error of 20% and an effect size of .21. Table 4c presents the predicted probability of success for a student in an English, business or social science course based on the number of SI sessions attended. Controlling for all other variables included in the model, students who attended a total of 8 SI sessions had a predicted success rate of 79%, compared to a predicted success rate of 61% for students who did not participate in SI. Students who attended 16 sessions (about one per week) had a predicted success rate of 90%, and students who attended 24 sessions had a predicted success rate of 96%.

Table 4c. Predicted Probability of Success in Course by Number of SI Sessions Attended

Intercept	Mean Gender	Mean Cumulative GPA	Mean Low-income	Mean Unit Load	Mean Social Science	SI Sessions Attended	Probability of Success
-3.458	.56	2.44	.46	12.32	.82	0	.61
-3.458	.56	2.44	.46	12.32	.82	8	.79
-3.458	.56	2.44	.46	12.32	.82	16	.90
-3.458	.56	2.44	.46	12.32	.82	24	.96

Figure 3 illustrates the predicted probability of success based on the number of SI sessions attended. As the figure shows, students have a substantially higher chance of passing the course if they attend one SI session roughly every other week than if they do not attend at all. Students' chances of success continue to increase with each additional sessions attended, but the increase in predicted success rate is considerably smaller after about 16 sessions.

Figure 1. Predicted Success Rates for SI-Participating Courses by Number of SI Sessions Attended



## CONCLUSIONS

The aim of the present study was to examine the impact of supplemental instruction on student outcomes in English, business and social science courses for which SI was available. Specifically, the present study investigated the impact of SI (controlling for other factors) on student success in Preparatory English, Written Communications, Principles of Accounting, History of the United States, African American History, Mexican-American History and Introductory Logic during the spring 2009 term. Overall, the results of the study show that student participation in SI is indeed related to student success.

Previous studies on student outcomes and learning assistance program participation have shown that students who participate in SI are more likely to succeed in their courses. In the present study preliminary analyses revealed similar findings: students who participated in SI had a substantially higher chance of success than those who did not participate. To determine if SI participation was a significant predictor of student success controlling for other relevant factors, a multivariate logistic regression model was utilized. Course sample sizes were too small to conduct multivariate course-level analysis, so data for students in all SI-participating courses were combined and coded by course discipline.

Even after controlling for gender, previous academic performance, low-income status, unit load and social science course status, SI session attendance emerged as a significant predictor of student success. Interestingly, although tutoring was included in preliminary analyses, it did not emerge as a significant predictor of success. Furthermore, participation in just one SI session did not add significantly to a student's predicted success rate, but regular (weekly or bi-weekly) participation in SI equated to substantially higher predicted success rates. For example, students who attended about one SI session every other week had nearly an 80% chance of success, versus 61% for students who did not participate in SI. It should be noted that although predicted success rate increased with each additional SI session attended, increases in success began to level off after 16 SI sessions.

These results build upon the findings of previous studies, which showed that students who participated in SI were more likely to succeed than students who did not participate in SI (Bowles & Jones, 2003-2004; Ogden et al, 2003; International Center for Supplemental Instruction, 2007). The findings of the study suggest that, when SI is available, students who regularly participate in SI are more likely to succeed than students who do not participate. Based on the results of the present study as well as those from previous studies, SI appears to be a valuable learning assistance program that provides participating students with a substantially greater chance of successfully passing a course.

There are, as with any study, limitations to present study. The data in the current study represent only a small selection of courses, and participation in SI was completely voluntary. Previous studies of SI at Delta College have shown positive SI results in social science courses, but not for English courses. The numbers for English courses were too small to be examined independently in the current study. Based on the results of the present study, social science course status was a factor in student success, and in the future, social science courses should be analyzed separate from English or other courses to determine if SI is effective and/or appropriate for courses in other disciplines. There also may be a grade inflation factor at work in some of the social science sections, which may have contaminated the data and results.

In addition, because participation in SI was completely voluntary, there is a possibility that self-selection bias may have influenced results, therefore limiting the generalizability of the study's findings. Students who participated in SI differed from students who did not participate in important ways. SI participants were more likely to have completed an orientation course, more likely to have participated in a learning community, more likely to have received tutoring; SI participants also scheduled, on average, more counseling appointments than non-participants. Each of these factors has been linked to student success in previous studies at Delta College, indicating that perhaps SI participating students are more focused and/or engaged with their college experiences to begin with. In sum, it may be the case that students who are predisposed to seek learning assistance are more motivated to succeed than others.

Additional research on program effectiveness with different students and skill levels is needed. Research should also be conducted to determine which students are best served by SI and which courses or subject areas are most appropriate for SI. SI and tutoring may or may not be similarly effective with students who enter a course at different skill and achievement levels. In addition, previous studies have shown that SI was implemented differently in different courses, leaving some question about treatment quality and intensity. Future studies should be conducted to examine SI implementation and best practices as well as the impact of SI over a number of semesters, with different student populations and across many different courses.

## REFERENCES

- Bowles, T.J. & Jones, J. (2003/2004). The effect of supplemental instruction on retention: A bivariate probit model. *Journal of College Student Retention*, 5(4), 431-437.
- Bowles, T.J., McCoy, A.C. & Bates, S. (2008). The effect of supplemental instruction on timely graduation. *College Student Journal* 42(3), 853-859.
- Congos, D.H. & Schoeps, N. (1999/2000). Methods to determine the impact of SI programs on colleges and universities. *Journal of College Student Retention*, 1(1), 59-82.
- International Center for Supplemental Instruction. (2007). Supplemental Instruction: National data. Retrieved November 30, 2009 from <http://www.umkc.edu/cad/si/publications.shtml>.
- Ogden, P., Thompson, D. & Simons, C. (2003). Supplemental instruction: Short and long-term impact. *Journal of Developmental Education*, 26(3), 1-8.