

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

As one of two distinct learning centers at the College, the Reading/Writing Learning Center (RWLC) is a multi-faceted learning center that offers various learning assistance services to students, including:

- Tutoring in content areas (business, social science, foreign language and other courses)
- Tutoring in reading
- Tutoring in writing
- Workshops related to organization, writing, formatting and citing sources
- Supplemental instruction

As an institutional grant, the College's Title V project has funded many learning assistance programs and services offered at the RWLC since fall 2007, including the center's supplemental instruction (SI) program. The goals of the RWLC supplemental instruction program 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.

**► The RWLC Supplemental Instruction Program**

The RWLC SI program is based on the University of Missouri, Kansas City (UMKC) model, which includes the recruitment of a previously successful student to sit in on class sessions and facilitate peer learning in structured, scheduled out-of-class SI sessions. Originally developed for science courses, SI has shown promising results in science, social science, business math and humanities courses (International Center for Supplemental Instruction, 2007). The SI program at the RWLC generally targets historically difficult social science, business, communication studies and English courses. In order for a course to qualify for SI at the College, the pass rate for the course must be below 65%.

Once a course has been deemed eligible for SI based on student pass rate, faculty members are recruited to offer SI for their courses. Faculty participation in the program is completely voluntary. The number and variety of courses and sections with SI components varies from semester to semester, depending on faculty participation and funding levels. In course sections that 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.

**► Previous Research on Supplemental Instruction**

Research conducted on SI at other institutions consistently shows that SI is positively associated with student success. Several studies have been conducted to examine the relationship between SI

and student success at the course level (Bowles & Jones, 2003-2004; Moore & LeDee, 2006; Ogden, Thompson, Russell & Simons, 2003; International Center for Supplemental Instruction, 2007). Although few studies have examined the long-term impact of SI, those that have been conducted revealed a positive association between SI and long-term student outcomes, such as term-to-term persistence and graduation (Bowles, McCoy & Bates, 2008; Ramirez, 1997).

Although the literature on SI has shown that SI-participating students generally have higher course GPAs or are more likely to pass the course than non-participants, few studies have controlled for other variables related to student success. A large portion of the research on SI effectiveness has included only descriptive statistical analysis, with students coded as either “participants” or “non-participants.” While informative as preliminary assessments of SI as a learning assistance program, these basic statistical analyses do not take into account external factors related to student success, such as motivation to succeed, previous academic performance, student engagement and student pre-college preparation (McCarthy & Smuts, 1997).

To better assess the unique contribution of SI to student success in the long- and short-term, recent studies of SI have developed multivariate models of student success, retention and graduation. These models, which were typically applied to student data from four-year universities, utilized course grades or GPAs as the outcome of interest and previous academic performance, gender, and college entrance exam scores (SAT, ACT) as covariates with SI session attendance (Bowles & Jones, 2003-2004; Fairris, Peeples & Son, 2006; Ogden et al, 2003; Congos & Schoeps, 1999-2000).

Building upon this multivariate approach, three studies were conducted to examine SI effectiveness in English courses and social science courses at the College in spring 2008, fall 2008 and spring 2009. Each of these studies revealed positive results for the SI program in the RWLC. The present study was undertaken to determine if previously-observed results could be replicated with student data from fall 2009. The goals of the present study were to 1) examine the impact of supplemental instruction on student success in English and social science courses controlling for other factors, 2) determine if students who participate in SI differ significantly from their non-participating peers.

## **METHODOLOGY**

Student success, demographic and academic data were obtained from the College’s System 2000 database and were analyzed for students in all English and social science courses and sections with SI components. Tutoring and SI session attendance data were obtained from the College’s System 2000 database and RWLC internal databases. In fall 2009, a total of three courses (five sections) offered supplemental instruction to enrolled students. Specific SI courses included the following:

- Preparatory English (English 79)
- History of the United States (History 17A)
- Introductory Logic (Philosophy 30)

A total of 286 students enrolled in these course sections, accounting for a total of 287 enrollments—one student was enrolled in two SI-participating courses. Of the 286 students enrolled in these courses in fall 2009, 87 (30%) utilized the RWLC’s supplemental instruction services. Among students who participated in SI, the majority (78%) attended two or more one-hour SI sessions during the fall semester. Table 1 provides an overview of fall 2009 SI participation rates by course. As the table shows, SI participation rates varied greatly from course to course, ranging from 15% in Introduction to Logic to 53% in History of the United States.

Table 1. SI Participation by Course

Course	Enrolled	Attended at Least 1 SI Session	
	N	N	%
English 79	74	18	24.3%
History 17A	98	52	53.1%
Philosophy 30	115	17	14.8%
<i>Overall/Total</i>	<i>287</i>	<i>183</i>	<i>30.3%</i>

Note: Table illustrates duplicated data; one student was enrolled in two SI-participating courses

### ► SI Participants versus Non-Participants

In order to determine if SI participants differed significantly from their non-participating peers, demographic data were obtained for SI participants and non-participants. Initial results showed that SI participants were demographically quite different from non-participants in SI courses. For example, a disproportionately large percentage of SI-participating students came from non-white ethnic backgrounds—84% versus 64% for non-participants. In addition, female students were significantly more likely to participate in SI than male students, and SI-participating students were, on average, seven years older than non-participating students. Table 2a illustrates participant and non-participant demographics for SI participants and non-participants.

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

	Non-Participants N=200		SI Participants N=87	
	N	%	N	%
<b>Ethnicity**</b>				
African American	13	6.5%	12	13.8%
American Indian/Alaskan Native	3	1.5%	0	0.0%
Asian/Pacific Islander	37	18.5%	19	21.8%
Hispanic	61	30.5%	31	35.6%
White	73	36.5%	14	16.1%
Other/Unknown	13	6.5%	11	12.6%
<b>Gender*</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>
Female	99	49.5%	54	62.1%
Male	98	49.0%	31	35.6%
Unknown	3	1.5%	2	2.3%
<b>Age**</b>	<b>M</b>	<b>SD</b>	<b>M</b>	<b>SD</b>
	21.46	5.37	28.71	12.00

\*Significant at the 95% confidence level

\*\*Significant at the 99% confidence level

To identify any pre-existing academic differences between SI participants and non-participants, academic data were obtained for all students enrolled in SI-participating courses. The results of the analysis revealed that SI participants were markedly different from non-participants academically and in terms of utilization of campus resources, or academic engagement. For example, SI participants were somewhat better academic performers than non-participants prior to the fall 2009 semester. In addition, SI participants were enrolled in a slightly lower number of units than non-participants. In addition, SI participants were more likely to come from low-income households (66%) than non-

participants (39%). Table 2b illustrates academic, placement and service utilization data for SI participants and non-participants.

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

Academic Measures	Non-Participants N=200		SI Participants N=87	
	M	SD	M	SD
Previous Cumulative GPA*	2.58	.92	2.89	.69
Units Attempted (Spring 2009)**	11.45	3.90	10.09	4.25
Counseling Appointments Fall 2009+	0.45	0.87	1.29	1.29
RWLC Tutoring Hours**	0.07	0.70	2.24	6.72
Initial Math Assessment Level*	N	%	N	%
Level 1	47	24.9%	26	31.7%
Level 2	51	27.0%	31	37.8%
Level 3	91	48.1%	25	30.5%
Initial Writing Assessment level	N	%	N	%
Level 1	68	36.6%	33	44.0%
Level 2	65	34.9%	26	34.7%
Level 3	53	28.5%	16	21.3%
Initial Reading Assessment level	N	%	N	%
Level 1	49	26.2%	21	27.6%
Level 2	112	59.9%	40	52.6%
Level 3	26	13.9%	15	19.7%
EOPS Status*	N	%	N	%
Not an EOPS student	198	99.0%	82	94.3%
EOPS Student	2	1.0%	5	5.7%
DSPS Status*	N	%	N	%
Not an DSPS student	197	98.5%	82	94.3%
DSPS Student	3	1.5%	5	5.7%
BOGG Fee Waiver Status**	N	%	N	%
Did Not Receive BOG Fee Waiver	122	61.0%	30	34.5%
Received BOG Fee Waiver	78	39.0%	57	65.5%
Educational Goal*	N	%	N	%
No Transfer	65	32.5%	40	46.0%
Transfer	135	67.5%	47	54.0%
RWLC Tutoring Participation**	N	%	N	%
Did not receive tutoring in RWLC	196	98.0%	70	80.5%
Received tutoring in RWLC	4	2.0%	17	19.5%

Source: SJDC System 2000 Database

Note: 94% of all students enrolled in SI-participating courses completed the reading assessment; 91% completed the writing assessment, and 92% completed the math assessment.

+Significant at the 90% confidence level

\*Significant at the 95% confidence level

\*\*Significant at the 99% confidence level

As the table shows, in terms of initial assessment, students in each group were relatively similar, with one exception: non-participants were more likely (48%) to assess at Level 3 in math than SI

participants (31%). Interestingly, SI participants were less likely than non-participants to declare a primary educational goal of transfer to a four-year university. In terms of utilization of campus resources, SI participants were significantly more likely to be involved in special programs and seek counseling and learning assistance than non-participants. Specifically, SI participants were significantly more likely than non-participants to participate in Extended Opportunity Programs and Services (EOPS) and Disabled Support Programs and Services (DSPS). Finally, SI participants were significantly more likely to utilize campus support services, such as counseling appointments and tutoring.

The present study was undertaken to assess the effectiveness of SI in improving short-term student success in historically difficult courses controlling for competing factors. Several statistical tests were conducted, including chi-square, t-tests and logistic regression analysis. The results of the study are provided below.

### RESULTS

Overall, just over half (54%) of the students enrolled in SI-participating sections passed the course, and just over three in four (78%) students were retained in the course. Table 3 presents overall success rates for each SI-participating course.

*Table 3. Student Success Rate by Course*

Course	Enrolled	Successful	
	Number	Number	Percentage
English 79 (Preparatory English)	74	44	59.5%
History 17A (History of the United States)	98	56	57.1%
Philosophy 30 (Introduction to Logic)	115	54	47.0%
<i>Overall/ Total</i>	<i>287</i>	<i>154</i>	<i>53.7%</i>

As a preliminary analysis of student outcomes by SI participation, a chi-square analysis was conducted with course success (completion with a grade of C or better) and course retention as the outcomes of interest. Data for all SI-participating courses were combined and examined for SI participants and non-participants. As Table 4a illustrates, students who participated in SI were significantly more likely than non-participating students to pass the course (66% versus 49%); although SI participants had a slightly higher retention rate than non-participants, the difference was not statistically significant.

*Table 4a. Student Success and Retention by SI Participation*

	Enrolled	Successful**		Retained	
	N	N	%	N	%
Did not participate in SI	200	97	48.5%	151	75.5%
Participated in SI	87	57	65.5%	73	83.9%
<i>Total</i>	<i>287</i>	<i>154</i>	<i>53.7%</i>	<i>224</i>	<i>78.0%</i>

\*\*Significant at the 99% confidence level

The results of the initial chi-square analysis revealed that SI participants were more likely to pass and be retained in all SI-participating courses combined. When data were examined at the course level,

the results revealed significantly higher rates of success for SI participants in just one course: History of the United States. Although Introduction to Logic students who participated in SI had a higher rate of success than non-participants, the difference was not statistically significant. In Preparatory English, SI participants had a lower rate of success than non-participants, although the difference was not statistically significant. It should be noted that, on average, the number of SI sessions attended was significantly lower for students enrolled in Preparatory English (.49 sessions overall, 2.83 among SI participants) than for students enrolled in History of the United States and Introduction to Logic. Table 4b illustrates success rates for SI participants and non-participants by course.

*Table 4b. Student Success by SI Participation and Course*

Course	Enrolled	Successful	
		Number	Percentage
English 79 (Preparatory English)	Number	Number	Percentage
Non-participants	56	35	62.5%
SI Participants	18	9	50.0%
History 17A (History of the United States)**	Number	Number	Percentage
Non-participants	46	17	37.0%
SI Participants	52	39	75.0%
Philosophy 30 (Introduction to Logic)	Number	Number	Percentage
Non-participants	98	45	45.9%
SI Participants	17	9	52.9%

\*\*Significant at the 99% confidence level

These results present only a preliminary analysis of the short-term outcomes of supplemental instruction. Chi-square analysis does not take into account other factors related to student success, nor does it account for the possibility of self-selection bias. In order to determine if supplemental instruction participation was a significant predictor of student success in English and social science courses when controlling for other factors, logistic regression analyses were conducted. Course success served as the dependent (outcome) variable. A total of 209 students were included in the logistic regression model. The remaining 78 students featured missing data for one or more of the variables included in the model. Because sample sizes at the course level were relatively small, all three courses (five sections) were included in one regression model, and a variable was added to distinguish social science courses from English courses.

Previous studies of learning assistance and student services programs at the College have linked several factors to student success, including demographic factors, unit load, and participation in other special services and programs, such as EOPS, counseling and tutoring.

These and other related variables were included in preliminary analyses for the current study, but only six variables emerged as significant predictors of student success, including:

- Gender
- Previous cumulative GPA
- Initial reading placement
- Initial math placement
- Course discipline (social science or not)
- Number of SI sessions attended

Although educational goal (transfer versus non-transfer) was not a statistically significant predictor of success, the variable was included in the final model to improve model fit. In addition, hours of tutoring received was strongly correlated with SI sessions attended ( $r=.405, p<.01$ ), but tutoring did not emerge as a statistically significant predictor of success. Even so, to control for any possible influence on student success, hours of tutoring received was included in the final regression model. Descriptive statistics and coding schemes for each variable included in the final regression model are provided in Table 5a.

*Table 5a. Descriptive Statistics for Variables in the SI Logistic Regression Model*

<b>Group</b>	<b>Range of Scores/Coding Scheme</b>	<b>Mean</b>	<b>SD</b>
Gender	Female=0 Male=1	.48	.50
Previous cumulative GPA	0.00 to 4.00	2.64	.87
Initial reading assessment level	1 to 3	1.89	.67
Initial math assessment level	1 to 3	2.20	.83
Educational goal	No transfer=0 Transfer=1	.64	.48
Course discipline	0=Not Social Science 1=Social Science	.73	.44
RWLC tutoring hours	0.00 to 31.67	.76	4.17
SI sessions attended	0 to 39	2.13	5.43
Success	0=Not successful; 1=Successful	.52	.50

Table 5b presents coefficients, standard errors and odds ratios for each predictor in the model.

Table 5b. Logistic Regression for Success in SI-Participating Courses

Predictor	B	Standard Error	Odds Ratio
Constant	-4.444	.863	.012
Gender*	.647	.325	1.909
Previous cumulative GPA**	.845	.208	2.328
Initial reading assessment level+	.502	.273	1.652
Initial math assessment level*	.449	.210	1.567
Educational goal	.455	.339	1.576
Course discipline+	-.705	.389	.494
RWLC tutoring hours	-.022	.058	.978
SI sessions attended**	.151	.056	1.163

+Significant at the 90% confidence level

\*Significant at the 95% confidence level

\*\*Significant at the 99% confidence level

Negative 2 Log Likelihood Ratio 238.601

Model Chi Square 14.380

Percent of Cases Correctly Predicted 72.2%

Proportional Reduction in Error 42.4%

Nagelkerke R<sup>2</sup> .288

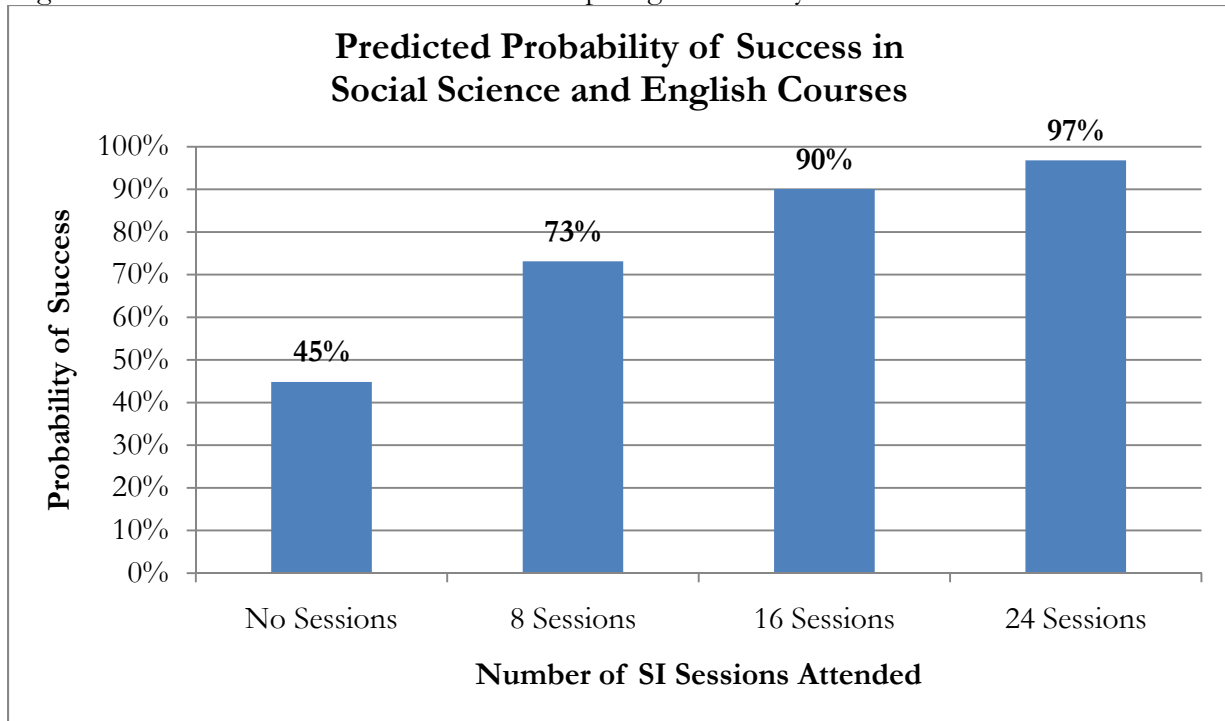
The final regression model resulted in a proportional reduction in error of 42% and an effect size of .29. Table 5c presents the predicted probability of success for a student in an English or social science course based on the number of SI sessions attended. Controlling for all other variables included in the model, students who attended a total of eight SI sessions had a predicted success rate of 73%, compared to a predicted success rate of 45% 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 97%.

Table 5c. Predicted Probability of Success in Course by Number of SI Sessions Attended

Intercept	Mean Gender	Mean Cumulative GPA	Mean Reading Level	Mean Math Level	Mean Ed Goal	Mean Social Science	Mean Tutoring Hours	SI Sessions Attended	Probability of Success
-4.444	.48	2.64	1.89	2.20	.64	.73	.76	0	.45
-4.444	.48	2.64	1.89	2.20	.64	.73	.76	8	.73
-4.444	.48	2.64	1.89	2.20	.64	.73	.76	16	.90
-4.444	.48	2.64	1.89	2.20	.64	.73	.76	24	.97

Figure 1 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 success in English and social science courses in fall 2009. Specifically, the present study investigated the impact of SI (controlling for other factors) on student success in Preparatory English, History of the United States, and Introduction to Logic during the fall 2009 term. Consistent with previous research findings, the results of the study reveal that student participation in SI is indeed related to student success.

Previous studies at Delta College and other institutions have shown that students who participate in SI are more likely to succeed in their courses (Bowles & Jones, 2003-2004; Moore & LeDec, 2006; Ogden, Thompson, Russell & Simons, 2003). The findings of the present study revealed similar outcomes: students who participated in SI had a substantially higher chance of success than those who did not participate. A multivariate logistic regression model was developed, and student success data was analyzed for all SI-participating courses combined.

The final regression model included the following predictor variables: student gender, previous cumulative GPA, initial reading placement, initial math placement, primary educational goal, social science course status, hours of tutoring received, and number of SI sessions attended. Six of these variables (gender, previous cumulative GPA, social science course status, initial reading placement, initial math placement, and number of SI sessions attended) emerged as statistically significant predictors of student success. Interestingly, although hours of tutoring received were highly correlated with number of SI sessions attended, tutoring was not a statistically significant predictor of student success.

These findings are consistent with previous studies conducted on SI and student success in the College's English and social science courses. Although participation in just one SI session did not add significantly to a student's predicted success rate, regular (weekly or bi-weekly) participation in SI equated to considerably higher predicted success rates. For example, students who attended about one SI session every other week had nearly a three in four (73%) chance of success, versus 45% 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 predicted success rate began to level off after 16 SI sessions.

The findings of the study suggest that, when SI is available, students who regularly participate in SI are significantly more likely to succeed than students who do not participate. The results of this and previous studies consistently show SI to be a valuable learning assistance program, particularly in social science courses, that provides participating students with a substantially greater chance of successfully passing a course.

There are, as with any study, several limitations to current study. The data in the current study represent only a small selection of courses, and participation in SI was completely voluntary. Given the nature of SI participation, it is possible that a self-selection bias influenced the results of the present study, which may limit the generalizability of the study's findings. Furthermore, preliminary analysis of SI participants and non-participants revealed important demographic and academic differences between the two groups. For example, SI participants were older, more likely to be female and more likely to come from non-white ethnic backgrounds than non-participants. In addition, SI students were, on average, better academic performers prior to the fall 2009 term. SI students were also more likely than non-participants to participate in special programs, such as EOPS and DSPS. Finally, SI participants were more likely to utilize campus resources, such as tutoring and counseling, than non-participants. Each of these factors has been linked to student success in previous studies at Delta College and these findings imply that SI participants may be more motivated and/or academically engaged to begin with.

In addition, previous studies of SI at Delta College and other institutions (International Center for Supplemental Instruction, 2007) have shown positive results for SI in social science and other content courses, but not necessarily for English courses. In the present study, SI outcomes for English courses were less positive than for social science courses. In light of this, additional studies are required to determine whether SI is appropriate and/or effective in and English/composition courses, and future studies should examine SI outcomes at the discipline level.

Although the results of the present study demonstrate that SI is an effective learning assistance program overall, additional research on the effectiveness of SI with different students and skill levels is needed. Future research on SI should also incorporate course- or discipline-level analysis to determine if the traditional SI model is effective in certain subject areas, such as English. Additional studies should also be conducted to identify factors relating to a student's decision to participate in SI. Finally, future studies should be conducted to examine the long-term impact of SI on student persistence, graduation, involvement in peer learning and utilization of metacognitive strategies.

## 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.
- Fairris, D., Peeples, J. & Son, J. (2006). A statistical evaluation of the Supplemental Instruction program: University of California, Riverside fall 2006. Retrieved April 8, 2010 from <http://irue.ucr.edu/reports/reports.html>.
- Hensen, K.A. & Shelley, M.C. (2003). The impact of Supplemental Instruction: Results from a large, public, mid-western university. *Journal of College Student Development*, 44(2), 250-259.
- International Center for Supplemental Instruction. (2007). Supplemental Instruction: National data. Retrieved November 30, 2009 from <http://www.umkc.edu/cad/si/publications.shtml>.
- Martin, D.C. & Arendale, D.R. (1992) Supplemental Instruction: Improving first-year student success in high-risk courses. *The Freshman Year Experience, Monograph Series Number 7*. ERIC Document HE 026620.
- McCarthy, A. & Smuts, B. (1997). Assessing the effectiveness of supplemental instruction: A critique and a case study. *Studies in Higher Education*, 22(2), 221-231.
- Moore, R. & LeDee, O. (2006). Supplemental instruction and the performance of developmental education students in an introductory biology course. *Journal of College Reading and Learning*, 36(2), 9-20.
- Ogden, P., Thompson, D. & Simons, C. (2003). Supplemental Instruction: Short and long-term impact. *Journal of Developmental Education*, 26(3), 1-8.
- Ramirez, M. (1997). Supplemental Instruction: The long-term impact. *Journal of Developmental Education*, 21(1), 2-9.