Analysis of Supplemental Instruction as a Factor in Contributing to Student Success

■ INTRODUCTION

Since spring 2005, Ventura College has been offering **supplemental instruction** (**SI**) in selected courses. Currently (spring 2010), there are a total of **39 SI** sections; SI is offered in three disciplines: English, ESL and Mathematics. Funding for **SI** is provided through several sources: the Basic Skills Initiative, the college's Title V Grant, Federal Work Study, and the college's General Fund.

The **success** (final grade of A, B, C or P) **rate** of students who participate in **SI** usually ***far exceeds*** the success rate of students in the **same** sections who do not participate in **SI** (e.g., in fall 2009 in ENGL V02 sections offering SI, the success rate of SI students was 86% versus 66% for the non-SI students in the same sections). Since **SI** participation is ***optional***, it would be difficult to demonstrate that the higher success rate of SI students is directly related to participation in SI activities. Additionally, motivated students may be the most likely individuals to enroll in sections that offer SI.

■ PURPOSE

The purpose of this study is to determine whether students enrolled in **SI sections** are more likely to be successful in the course than are students who enrolled in sections of the same course that did **not** offer supplemental instruction. Data used in this study are final grades from the following **fall 2009** courses: ENGL V02, ENGL V03, MATH V01, and MATH V03. Two statistical measures were used:

(a) Chi-Square Test: To find out whether there is a significant difference between success rates in SI sections and success rates in non-SI sections of the same course

(b) Phi Coefficient: To determine the degree of association (correlation) between course success and enrollment in a section that offers SI.

■ SUMMARY

The table below summarizes fall 2009 enrollments and success data for the **four** courses in the study.

Fall 2009	Non-SI Sections		SI Sections		Diff. in	Chi Square **		Phi Coefficient	
Course ID	Total Enrolls	Succ. Rate	Total Enrolls	Succ. Rate	Succ. Rates*	X^2 Stat.	Significant at .05 level	Φ Coef.	Interpre-tation
ENGL V02	555	66%	192	76%	+10	6.05	Yes	.09	Very Weak
ENGL V03	116	57%	169	70%	+13	5.02	Yes	.13	Very Weak
MATH V01	356	47%	283	50%	+3	0.67	No	---	----------
MATH V03	675	41%	76	30%	-11	3.57	No	---	----------

* **Differences in Success Rates** are expressed in ***percentage points***.
A ***negative*** difference in success rates indicates that the non-SI success rate is higher than the SI success rate.

** To be significant at the **.05 level** with **df =1**, the X^2 statistic must ***exceed*** the critical value of **3.84**.

For both **ENGL** courses, the differences between success rates in SI sections and non-SI sections were ***significant***. For both of the **MATH** courses, however, the differences between success rates in SI sections and non-SI sections were ***not significant***. Also, it should be noted that in MATH V03 the **non-SI** success rate was higher than the **SI** success rate. In both **ENGL** courses, the correlation between success and supplemental instruction were found to be ***very weak***. Results for each of the four courses are presented in the table that follows.

Course ID	Success Rate in SI Sections:	Correlation Between Success and SI:
ENGL V02	Is significantly **higher** than in **non-SI** sections	Is very weak
ENGL V03	Is significantly **higher** than in **non-SI** sections	Is very weak
MATH V01	Is **not** significantly **higher** than in **non-SI** sections	Was not calculated, since X^2 is not significant
Course ID	**Success Rate in non-SI Sections:**	**Correlation Between Success and non-SI:**
MATH V03	Is **not** significantly **higher** than in **SI** sections	Was not calculated, since X^2 is not significant

■ DATA TABLES

• SI Participation Rates

The **SI Participation Rate** is one measure of the level of student interest in (use of) SI services. An SI Participation Rate was computed for each of the courses in the study. The rates were calculated as follows: ((**Number of SI Students**) ÷ (**Total Students in SI Sections**)) **x 100**

Aggregate Enrollments Data for Sections that Offered SI			
Fall 2009 Course ID	**Total Students in SI Sections**	**Number of SI Students**	**SI Participation Rate**
ENGL V02	192	93	48%
ENGL V03	169	93	55%
MATH V01	283	116	41%
MATH V03	76	29	38%

• Grades Distributions

For each of the courses, the **Grades Distribution** table indicates final grades allocations for **all non-SI sections** and for **all SI sections**. Total students, the number of successful students, and the success rate are also indicated for each of the categories (i.e., Non-SI Sections and SI Sections). The total number of students and the number successful students in each category are used in calculating the Chi Square Statistic.

ENGL V02	Total	Successful		Grades Distribution							
Category	Students	Number	Percent	A	B	C	P	D	F	NP	W
Non-SI Sections	555	366	65.9%	138	128	100	0	46	45	0	98
SI Sections	192	145	75.5%	44	65	35	1	18	14	0	15

ENGL V03	Total	Successful		Grades Distribution							
Category	Students	Number	Percent	A	B	C	P	D	F	NP	W
Non-SI Sections	116	66	56.9%	---	---	---	66	---	---	32	18
SI Sections	169	118	69.8%	---	---	---	118	---	---	34	17

MATH V01	Total	Successful		Grades Distribution							
Category	Students	Number	Percent	A	B	C	P	D	F	NP	W
Non-SI Sections	356	167	46.9%	44	49	74	0	37	70	1	81
SI Sections	283	142	50.2%	45	48	49	0	26	44	0	71

MATH V03	Total	Successful		Grades Distribution							
Category	Students	Number	Percent	A	B	C	P	D	F	NP	W
Non-SI Sections	675	280	41.5%	75	86	118	1	62	137	1	195
SI Sections	76	23	30.3%	7	9	6	1	4	6	2	41

• Chi Square Statistic and Phi Correlation Coefficient

In the tables on the following two pages, a Chi Square Statistic and a Phi Correlation Coefficient were calculated for each of the courses.

• ENGL V02

▪ Chi Square Statistic

Course Outcome	Non-SI Sections		SI Sections		Row Totals
Successful Grade of A, B, C, P	A	366	B	145	511
Not Successful Grade of D, F, NP, W	C	189	D	47	236
Column Totals		555		192	747

Instructional Category

	Expected Frequencies	Individual Chi Squares
Cell A:	(511) x (555) ÷ 747 = 379.66	$(366 – 379.66)^2$ ÷ 379.66 = 0.491
Cell B:	(511) x (192) ÷ 747 = 131.34	$(145 – 131.34)^2$ ÷ 131.34 = 1.421
Cell C:	(236) x (555) ÷ 747 = 175.34	$(189 – 175.34)^2$ ÷ 175.34 = 1.064
Cell D:	(236) x (192) ÷ 747 = 60.66	$(47 – 60.66)^2$ ÷ 60.66 = 3.076
	Total students = 747.00	Total Chi Square = **6.052**

df = (row total – 1) x (column total – 1) = 1 With df = 1, tabled value is **3.84**.

The ***chi square*** of **6.05** **exceeds** the tabled value of **3.84** and is, therefore, **significant** at the **.05** level. **Successful** course completions by **SI** students are significantly ***higher*** than for **non-SI** students.

▪ Phi Correlation Coefficient

Phi = $\sqrt{\text{Chi Square} \div N}$ = $\sqrt{6.35 \div 747}$ = $\sqrt{0.00081017}$ = **0.0900 = .09**

A **.09** correlation coefficient shows a ***very weak*** relationship between course success and SI participation.

• ENGL V03

▪ Chi Square Statistic

Course Outcome	Non-SI Sections		SI Sections		Row Totals
Successful Grade of A, B, C, P	A	66	B	118	184
Not Successful Grade of D, F, NP, W	C	50	D	51	101
Column Totals		116		169	285

Instructional Category

	Expected Frequencies	Individual Chi Squares
Cell A:	(184) x (116) ÷ 285 = 74.89	$(66 – 74.89)^2$ ÷ 74.89 = 1.055
Cell B:	(184) x (169) ÷ 285 = 109.11	$(118 – 109.11)^2$ ÷ 109.11 = 0.725
Cell C:	(101) x (116) ÷ 285 = 41.11	$(50 – 41.11)^2$ ÷ 41.11 = 1.923
Cell D:	(101) x (169) ÷ 285 = 59.89	$(51 – 59.89)^2$ ÷ 59.89 = 1.320
	Total students = 285.00	Total Chi Square = **5.023**

df = (row total – 1) x (column total – 1) = 1 With df = 1, tabled value is **3.84**.

The ***chi square*** of **5.02** **exceeds** the tabled value of **3.84** and is, therefore, **significant** at the **.05** level. **Successful** course completions by **SI** students are significantly ***higher*** than for **non-SI** students.

▪ Phi Correlation Coefficient

Phi = $\sqrt{\text{Chi Square} \div N}$ = $\sqrt{5.020 \div 285}$ = $\sqrt{0.01761400}$ = **0.1327 ≈ .13**

A **.13** correlation coefficient shows a ***very weak*** relationship between course success and SI participation.

• MATH V01

▪ Chi Square Statistic

Course Outcome		Instructional Category: Non-SI Sections		Instructional Category: SI Sections	Row Totals
Successful Grade of A, B, C, P	A	167	B	142	309
Not Successful Grade of D, F, NP, W	C	189	D	141	330
Column Totals		356		283	639

	Expected Frequencies	Individual Chi Squares
Cell A:	(309) x (356) ÷ 639 = 172.15	$(167 - 172.15)^2 \div 172.15 = 0.154$
Cell B:	(309) x (283) ÷ 639 = 136.85	$(142 - 136.85)^2 \div 136.85 = 0.194$
Cell C:	(330) x (356) ÷ 639 = 183.85	$(189 - 183.85)^2 \div 183.85 = 0.144$
Cell D:	(330) x (283) ÷ 639 = 146.15	$(141 - 146.15)^2 \div 146.15 = 0.181$
	Total students = 639.00	Total Chi Square = **0.673**

df = (row total – 1) x (column total – 1) = 1 With df = 1, tabled value is **3.84**.

The ***chi square*** of **0.67** is **less than** the tabled value of **3.84** and is, therefore, **not significant** at the **.05** level. **Successful** course completions by **SI** students are **not** significantly ***higher*** than for **non-SI** students.

▪ Phi Correlation Coefficient

Since the Chi Square Statistic is **not significant**, there is no reason to compute the Phi Correlation Coefficient.

• MATH V03

▪ Chi Square Statistic

Course Outcome		Instructional Category: Non-SI Sections		Instructional Category: SI Sections	Row Totals
Successful Grade of A, B, C, P	A	280	B	23	303
Not Successful Grade of D, F, NP, W	C	395	D	53	448
Column Totals		675		76	751

	Expected Frequencies	Individual Chi Squares
Cell A:	(303) x (675) ÷ 751 = 272.34	$(280 - 272.34)^2 \div 272.34 = 0.215$
Cell B:	(303) x (76) ÷ 751 = 30.66	$(23 - 30.66)^2 \div 30.66 = 1.914$
Cell C:	(448) x (675) ÷ 751 = 402.66	$(395 - 402.66)^2 \div 402.66 = 0.146$
Cell D:	(448) x (76) ÷ 751 = 45.34	$(53 - 45.34)^2 \div 45.34 = 1.294$
	Total students = 751.00	Total Chi Square = **3.569**

df = (row total – 1) x (column total – 1) = 1 With df = 1, tabled value is **3.84**.

The ***chi square*** of **3.57** is **less than** the tabled value of **3.84** and is, therefore, **not significant** at the **.05** level. **Successful** course completions by **non-SI** students are **not** significantly ***higher*** than for **SI** students.

▪ Phi Coefficient

Since the Chi Square Statistic is **not significant**, there is no reason to compute the Phi Correlation Coefficient.