

A COMPARISON OF COURSE OUTCOMES FOR SUPPLEMENTAL INSTRUCTION AND TUTORING STUDENTS IN ANATOMY AND PHYSIOLOGY CLASSES SPRING 2008

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Background and Methodology

The Title V grant at San Joaquin Delta College includes a number of different programs and services designed to build institutional capacity to serve historically underrepresented students. One of the components of the grant included the creation of two distinct learning centers and supplemental instruction (SI) programs for students in each center. The SI program at the college aims to support student success in the college's most difficult courses and provides SI leaders for courses in both the Math/Science and Reading/Writing Learning Center. Participation in SI is completely voluntary, and SI-participating students are free to participate in other learning assistance programs. In addition to SI, each learning center also provides tutoring services for the college's most popular and/or historically difficult courses. The purpose of the present study was to determine if student outcomes varied by student participation in SI and/or tutoring. Based on a request of the Math/Science Learning Center coordinator, data were analyzed for students in courses for which both SI and tutoring were available in the spring 2008 term.

Data were obtained from the college's internal database and from the Math/Science Learning Center's attendance and participation data files. SI was offered for two science courses in spring 2008: Biology 31 (Anatomy) and Biology 32 (Physiology). Based on participation data for both tutoring and SI, students were coded into one of four categories of program participation: SI only, tutoring only, both SI and tutoring and neither SI nor tutoring. Crosstabs and chi-square analyses were conducted to determine if there were differences in success rates by program participation category. Success is defined as earning a grade of C or higher in a course. Analysis of Covariance (ANCOVA) tests were also conducted to determine if final course grades differed between the groups after controlling for students' cumulative GPA prior to taking the course.

Results

Students who participated in a learning assistance program were significantly more likely to pass Biology 31 and Biology 32. In Biology 31 retention and success rates were highest (89%) for students who participated in both tutoring and supplemental instruction. Both retention and success rates for students who participated in tutoring only were also higher (71% for retention and 89% for successful completion) than those of the remaining two groups. Students who participated in SI had success rates somewhat lower (36% versus 42%) and retention rates that were only slightly higher (64% versus 61%) than students who participated in neither SI nor tutoring. It should be noted that students receiving SI services only amounted to 11 of the 350 students (total), so the data for this group should be interpreted with some caution.

Table 1a. Retention and Success Rates for Biology 31 by Participation in Learning Assistance

Group	Enrolled	Successful**		Retained*	
		n	%	n	%
No tutoring or SI	231	96	41.6%	140	60.6%
SI only	11	4	36.4%	7	63.6%
Tutoring only	80	47	58.8%	57	71.2%
SI and tutoring	28	23	82.1%	25	89.3%
<i>Total/Overall</i>	<i>350</i>	<i>170</i>	<i>48.6%</i>	<i>229</i>	<i>65.4%</i>

Note. Tutoring participation is defined as attending one hour or more of tutoring

*Significant at the 95% confidence level

**Significant at the 99% confidence level

In terms of grades, students who participated in both tutoring and SI had higher average final course grades than students who participated in tutoring only, SI only or did not participate in either program. However, differences in final course grades were not statistically significant after controlling for students' cumulative GPAs prior to enrolling in the course.

Table 1b. Course Grade for Biology 31 by Participation in Learning Assistance

Group	Enrolled	Mean Course GPA*	SD
No tutoring or SI	119	1.96	1.28
SI only	7	1.71	1.38
Tutoring only	49	2.33	1.14
SI and tutoring	21	2.81	1.08
<i>Total/Overall</i>	<i>196</i>	<i>2.13</i>	<i>1.26</i>

*Significant at the 95% confidence level

** Significant at the 99% confidence level

Note: After controlling for fall 2007 cumulative GPA, differences in mean course GPA were not significant at 95% confidence level.

In Biology 32, students who participated in tutoring and SI were most likely (71%) to pass the course, followed by students who participated in just tutoring (61%). Just over half (55%) of the students who solely participated in SI passed the course, and only 40% of students who did not participate in either SI or tutoring passed the course. Students who participated in tutoring only were most likely (89%) to be retained in the course, followed closely by students who participated in both tutoring and SI (87%). Nearly three quarters (72%) of the students who participated in just SI were retained, and 62% of students who did not participate in either program were retained.

Table 2a. Retention and Success Rates for Biology 32 by Participation in Learning Assistance

Group	Enrolled	Successful**		Retained*	
		n	%	n	%
No tutoring or SI	92	37	40.2%	57	62.0%
SI only	29	16	55.2%	21	72.4%
Tutoring only	18	11	61.1%	16	88.9%
SI and tutoring	39	29	71.4%	34	87.2%
<i>Total/Overall</i>	178	93	52.2%	128	71.9%

*Significant at the 95% confidence level

**Significant at the 99% confidence level

Students who participated in both SI and tutoring had, on average, higher course grades than other students. Mean course grades for students who participated in tutoring only were also higher than those for students who participated in SI only and students who participated in neither tutoring nor SI. Differences between groups were statistically significant even after controlling for cumulative GPA.

Table 2b. Course Grade for Biology 32 by Participation in Learning Assistance

Group	Enrolled	Mean Course GPA	SD
No tutoring or SI	51	1.96	1.23
SI only	19	2.21	1.03
Tutoring only	15	2.60	1.64
SI and tutoring	33	2.82	1.13
<i>Total/Overall</i>	118	2.32	1.27

Note: Controlling for fall 2007 cumulative GPA, differences in mean GPA were significant at the 99.9% confidence level.

In order to determine if program participation predicted success in anatomy and physiology courses after controlling for demographic and academic factors, logistic regression analyses were conducted on Biology 31 data and Biology 32 data separately and then with both files merged. Data for both courses were combined, student participation group was used in lieu of tutoring hours and SI sessions, and logistic regression analyses were conducted. The final regression model is outlined below:

$$\text{Predicted probability of success} = a + b_1 (\text{age}) + b_2 (\text{gender}) + b_3 (\text{ethnicity}) + b_4 (\text{cumulative GPA}) + b_5 (\text{participant group}) + \text{error term (unexplained variance)}$$

Descriptive statistics for all variables included in the regression model are provided in Table 3a.

Table 3a. Descriptive Statistics for Variables in the Logistic Regression Model

Group	Range of Scores/Coding Scheme	Mean	SD
Age	16 to 55	25.55	8.11
Gender	0=Female 1=Male	.19	.39
Ethnicity	0=White 1=Non-white	.73	.44
Cumulative GPA (as of fall 2007)	0 to 4	2.92	.68
SI Only	0=Not SI-only 1=SI only	.08	1.13
Tutoring Only	0=Not tutoring only 1=Tutoring only	.19	1.13
Tutoring and SI	0=Not tutoring and SI 1=Tutoring and SI	.13	1.13
Success	0=Not successful 1=Successful	.50	.50

Table 3b. Logistic Regression for Success in Biology 31 and Biology 32 Courses

Predictor	B	Standard Error	Odds Ratio
<i>Constant</i>	<i>-3.700</i>	<i>.681</i>	<i>.025</i>
Age	.013	.014	1.013
Gender	.398	.271	1.489
Ethnicity	-.136	.246	.873
Cumulative GPA	1.081**	.184	2.949
Group (SI only versus no services)	.062	.362	1.064
Group (tutoring versus no services)	.574*	.280	1.775
Group (SI and tutoring versus no services)	1.669**	.402	5.306

*Significant at the 95% confidence level

**Significant at the 99% confidence level

Negative 2 Log Likelihood Ratio	521.96
Model Chi Square	83.58
Percent of Cases Correctly Predicted	67.3%
Proportional Reduction in Error	32.8%
Nagelkerke R ²	.232

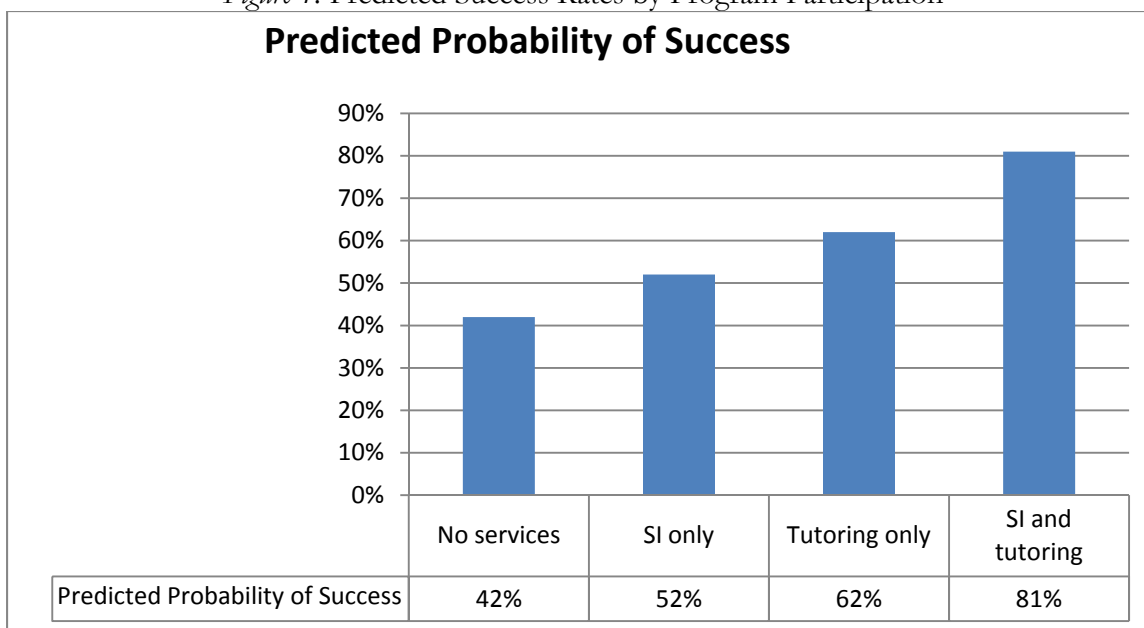
The full model, in which all predictor variables were entered, resulted in a proportional reduction in error of 33%. Because student participant group was a categorical variable with more than two levels, students who received no tutoring or SI services were used as the reference group with which all other student groups (SI only, tutoring only, and both SI and tutoring) were compared. The participation group variable was recoded into three dichotomous variables representing student participation in tutoring and/or SI. As Table 3b shows, cumulative GPA and participant groups were the only statistically significant predictors of course success in the model.

When participant groups were broken down, only students who participated in tutoring alone or tutoring and SI were significantly more likely to succeed than their non-participating peers. Table 4 presents the predicted probability of success in a Biology 31 or Biology 32 course based on student participation in learning assistance programs. Holding all other predictor variables constant (at mean levels), students who participated in both tutoring and SI were the most likely to successfully complete the course, followed by students who participated in just tutoring. Indeed, students attending both tutoring and SI sessions had a 40% greater likelihood of success in a course than those who never attended. This enhanced pattern of success can be seen in Figure 1. These findings are consistent with the results of the preliminary analysis, which showed that students appear to benefit most from a combination of tutoring and supplemental instruction.

Table 4. Predicted Probability of Success by Learning Assistance Program Participation

Intercept	Mean Age	Mean Gender	Mean Ethnicity	Mean Cumulative GPA	Group	Probability of Success
-3.700	25.55	.19	.73	2.92	No Tutoring or SI	.42
-3.700	25.55	.19	.73	2.92	SI Only	.52
-3.700	25.55	.19	.73	2.92	Tutoring Only	.62
-3.700	25.55	.19	.73	2.92	Tutoring and SI	.81

Figure 1. Predicted Success Rates by Program Participation



Conclusions

Across all sections of Biology 31 and Biology 32 included in the study, overall course success rates were roughly 50%. Using a variety of statistical analyses, results consistently showed that across both courses, students who participated in both SI and tutoring had, on average, higher course grades and greater probability of success than students who participated in just SI or just tutoring. Students who participated in both programs also had course grades of almost one grade point higher than students who did not participate in either program.

Outcomes were also positive, but somewhat less so, for students who participated in just tutoring. These students were more likely to succeed in both courses and had higher course grades than students who participated in just SI or students who did not participate in either program. Results for students who participated in just SI were not quite as positive. Success rates and course grades were only slightly higher in Biology 32 for these students than for students who did not participate in either program. Outcomes for these students were even less positive in Biology 31. It should be noted that the number of students who participated in just SI was rather low, so these findings should be interpreted with caution.

Overall, these findings show promising results for the tutoring programs and mixed results for the SI programs in anatomy and physiology courses at the college. Students appear to benefit greatly from a combination of tutoring and SI but less so from SI alone. Based on these preliminary data, students do best when they participate in both tutoring and SI, followed by students who participated in just tutoring. There are, as with any study, limitations to the current findings. The data provided represent only courses and sections for which SI is available, and participation in SI and tutoring is completely voluntary. These factors introduce the possibility of a participant self-selection bias and may limit the generalizability of the results. Additional data are required from other SI-participating courses and students to assess the intermediate outcomes of SI across a wider variety of courses as well the long-term impact of SI on student outcomes.