

Chapter Two: Effectiveness of SI for Student Success

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Validation by U.S. Department of Education of SI's Effectiveness

After a rigorous review process in 1981, the SI Program became one of the few postsecondary programs to be designated by the U.S. Department of Education as an **Exemplary Educational Program**. The SI Program was recertified in 1985 and 1992. The U.S. Department of Education has validated the following three claims of effectiveness of the SI Program:

1. Students participating in SI within the targeted high risk courses earn higher mean final course grades than students who do not participate in SI. This is still true when differences are analyzed, despite ethnicity and prior academic achievement.
2. Despite ethnicity and prior academic achievement, students participating in SI within targeted high risk courses succeed at a higher rate (withdraw at a lower rate and receive a lower percentage of D or F final course grades) than those who do not participate in SI.
3. Students participating in SI persist at the institution (reenrolling and graduating) at higher rates than students who do not participate in SI.

Research Methodology for Study of SI Claims of Effectiveness

A. Research Design

The basic design of the evaluation compared performance of the treatment group (SI Participants) with the control group (Non-SI Participants). Additional analyses compared SI-participants to similar non-participants in terms of their motivation to participate, their prior academic achievement and their ethnicity. Dependent variables included final course grades, reenrollment and graduation rates. For the foregoing analyses, all students within the targeted SI courses were included, both those enrolled in UMKC and those enrolled in other institutions where SI had been adopted and evaluative data has been collected.

Six sets of studies used data from the UMKC program: historical data (Table 2); disaggregation of data by motivational control group (Table 3); longitudinal follow-up (Tables 5 and 6), disaggregation of data by prior academic achievement (Table 7); and ethnicity (Table 10). Two sets of studies contained data from other institutions that had implemented SI: cross-institutional (Tables 4, 8, and 9); and disaggregation of data by ethnicity (Tables 8 and 9).

B. Population

The population studied included all students enrolled in the courses in which SI was offered, whether or not they participated. The population represented students from UMKC and from many other institutions in the U.S. where SI had been adopted and effective data collection efforts had been made. Differences in performance were analyzed by covariance of ethnicity, motivation, prior academic achievement, and category of institution.

C. Instruments and Procedures

Course rosters and background data (e.g., ethnicity, standardized entrance test scores, high school rank) for students enrolled in SI targeted courses were obtained. A student survey was administered the first day of the course to find out the motivation level of the students concerning SI. Another survey was administered the last day of the course to gain information from SI-participants (e.g., evaluation of the SI program) and non-SI participants (e.g., reason for not attending SI). Faculty members in the targeted courses provided a list of students and their grades on the first major examination in the course. Final course grades, reenrollment and graduation data for students were also obtained after the semester for students enrolled in the targeted classes.

The procedures followed at UMKC were recommended to other participating institutions. Due to differing administrative structures of the many schools participating in the study, not all were able to gather data in precisely the way we recommended.

However, all reported their data gathering procedures and evaluators determined that data included in the study had either followed or had approximated the data gathering procedures followed at UMKC.

D. Data Collection

The UMKC National SI Director was in charge of all data collection and analysis. This person was responsible for the collection, analysis, writing, and distribution of periodic reports on the SI program's effectiveness. The National SI Director received the semester reports from the institutions that send reports to UMKC each year. A variety of instruments and procedures were used to obtain the information needed for an analysis of the data related to student enrollment in the targeted courses. The SI staff was carefully instructed in proper use of confidential student data. All university protocols were followed.

E. Data Analysis

Standard statistical methods were used in analysis of the data for comparing students. The level of significance was set at $p < .01$ when independent t-tests were employed for comparing final course grades. A significance level of $p < .05$ was set when using chi square tests for comparing: the percentage of A and B final course grades; the percentage of D and F final course grades and withdrawals; and the percentage of reenrollment. The chi square level of significance was set at less than $p < .01$ for the graduation study.

With chi square, using nominal data, $p < .05$ was used to heighten the sensitivity of measures. If an effect were present, we did not want to overlook it. On the other hand, when using interval data, we sought to enhance the specificity of the statistical test, not wishing to claim an effect that may not have been present. Additionally, we used $p < .05$ in measures we thought of as a preliminary, screening test. In more precise efforts to specify effects, we used $p < .01$.

Higher Grades and Lowered Rates of Course Withdrawals

Students participating in SI within the targeted high risk courses earn higher mean final course grades than students who do not participate in SI, despite ethnicity or prior academic achievement.

SI targets high-risk courses rather than high-risk students. At many campuses high-risk courses are typically defined as difficult, entry-level courses in which the unsuccessful enrollment rate (the percent of grades of D, F, and Withdrawals) is more than 30 percent. Examples of these courses at UMKC include: General Chemistry I, Western Civilization I and Foundations to Philosophy. Since a new SI program often places an emphasis on entry-level courses, SI has often served primarily first year and sophomore level students. However, the program has been effectively implemented in courses where students are likely to fail at the graduate and professional school level (e.g., Medicine, Dentistry, Pharmacy, Business, and Law) both at UMKC and other post-secondary institutions.

This history of success with SI in upper division courses was important because some institutions now implement SI to retain first-generation and low-income professional school students. Each institution can adjust the definition of "high risk courses" to meet their own institutional objectives and needs. SI is effective with students from a variety of ethnic, economic and academic preparation backgrounds.

Courses are designated as "high-risk" if in preceding semesters, students have a continuous record of receiving a high percentage of D, F or W final course grades. The purpose of attaching SI is to insure that the course is no longer "high-risk" for students. It does not, however, lose its "high-risk" status for services. Once the D, F and withdrawal rate has been reduced, the SI service is continued since we have not done anything to change the course per se. Data show that when we have not been able to continue an SI (e.g., cannot find a suitable SI Leader), the D, F and withdrawal rate returns to the original baseline. The only condition under which we choose to discontinue SI is when a change in the course results in uniformly high grades and,

subsequently, low levels of student participation in SI. We continuously monitor the impact of SI in every course where it is offered through comparative data for students who attend SI and those who do not attend.

Definition of "high-risk" course relates to a single factor: the number of students who successfully complete the course. For our purposes, we consider it irrelevant whether the high rate of poor grades and withdrawals is a function of the course content, the instructional method, the hour the course is offered, or the population to whom it is offered. What we consider important is that students have academic difficulty. We have found that SI reduces that difficulty. We make no claim that SI addresses every need. Our goal is not to evaluate curriculum or instructional delivery of the course professor, but to help the enrolled students by providing assistance for them in courses that create obstacles in completing their degree programs.

It should be noted that there is substantial evidence that attrition follows poor grades. Students tend not to withdraw from courses or drop out of college when grades are acceptably high. In 1990, Noel and Levitz from the National Center for Student Retention published a research study that suggested a strong correlation between grade point averages and persistence in college (Table 1). SI is designed to increase student academic performance that is generally indicated by higher final course grades.

**Table 1: Dropouts and Persisters
Separated by College Grade Point Average
(N of Students = 3,874 and N of Institutions = 43)**

Grade Point Average Range	Dropouts (N = 1,060 Students)	Persisters (N of Students = 2,814)
GPA Below 2.00	42.1% (N = 336)	15.8% (N = 445)
GPA 2.00 to 2.49	18.9% (N = 200)	24.9% (n = 701)
GPA 2.50 to 2.99	19.6% (N = 208)	26.2% (n = 737)
GPA 3.00 to 4.00	19.1% (N = 206)	33.1% (n = 931)

Noel and Levitz, 1990

Academic Achievement for UMKC Students

Since 1980, UMKC has offered SI in 190 courses. An analysis of data on grades and withdrawal rates (Table 2) found that the SI-participants: earned significantly higher percentage of A & B final course grades); significantly lower percentage of D & F final course grades and withdrawals; and significantly higher mean final course grades than the Non-SI participants. Each cell within Table 2 compared the SI and Non-SI groups. For instance, in 1990-91: 34.1% of the students (774 of the 2,270) in the SI classes participated in SI; SI-participants had a higher percentage of A & B final course grades (53.4% vs. 38.7%), lower percentage of D and F final course grades and withdrawals (16.0% vs. 31.2%) and a higher mean final course grade (2.61 vs. 2.23) than non-SI participants. These results have been consistent year after year in a variety of courses at the undergraduate, graduate and professional school level.

Table 2: SI UMKC Data: 1980 to 1991 (N=190 SI Courses; 7,845 SI-Participants)

Year	SI Participation Status	SI Participation Percent/Number	Number of SI Classes	Percent A & B	Percent D, F, & Withdrawal	Final Course Grade
1990-91	SI Non-SI	34.1% (774)	18	53.4%* 38.7%*	16.0%* 31.2%*	2.61** 2.23**
1989-90	SI Non-SI	30.3% (753)	19	58.3%* 41.9%*	16.7%* 34.8%*	2.70** 2.29**
1988-89	SI Non-SI	29.9% (614)	17	63.2%* 45.7%*	15.6%* 28.9%*	2.81** 2.39**
1987-88	SI Non-SI	34.1% (775)	24	60.4%* 43.8%*	13.7%* 28.9%*	2.80** 2.39**
1986-87	SI Non-SI	44.3% (778)	19	56.3%* 40.9%*	18.3%* 34.1%*	2.65** 2.41**
1985-86	SI Non-SI	39.1% (584)	16	51.5%* 41.2%*	18.7%* 28.7%*	2.55** 2.34**
1984-85	SI Non-SI	42.6% (788)	17	59.7%* 42.9%*	16.8%* 25.4%*	2.83** 2.27**
1983-84	SI Non-SI	34.1% (765)	19	54.5%* 39.5%*	17.3%* 29.5%*	2.76** 2.24**
1982-83	SI Non-SI	43.1% (1,119)	19	52.2%* 36.8%*	17.9%* 28.2%*	2.51** 2.07**
1981-82	SI Non-SI	40.9% (329)	5	58.2%* 38.5%*	20.9%* 26.7%*	2.61** 2.09**
1980-81	SI Non-SI	32.2% (566)	17	50.1%* 32.5%*	14.2%* 33.1%*	2.56** 2.16**

*Level of significance for differences: 0.05 using chi-square test. **Level of significance for differences: 0.01 using independent t-test.

Academic achievement for UMKC Non-SI motivational control groups.

To control for motivation level, all students were surveyed on the first day of class concerning interest in SI. Students were asked to rate their motivation to attend SI on a five-point Likert scale (5=high; 1=low). Since the scheduled times for the SI sessions were not announced until the second class sessions of the semester, students were not aware of any time conflicts. Students who selected "4" or "5" were designated as "highly motivated." During the last class period of the semester another survey was given to all students in the class. Students who did not attend any SI sessions during the semester were asked to select one of the designated choices for not attending SI. **If** a student selected either time conflict with work or with another college class, **and** they also indicated high motivation to attend SI on the first day SI survey, they were designated as the Non-SI Motivational Control Group.

Creation of the Non-SI motivational control group permitted comparison across the three groups: SI Participants, Non-SI Participants (Motivational Control), and Non-

SI Participants (All Others). The following differences were seen in the academic performance data in Table 3. Students using SI services: (a) have entry data (high school class rank percentile, and college entrance test scores) comparable to data of the other groups; (b) have significantly higher average course grades compared to both Non-SI groups ($p < .01$); and (c) have considerably fewer D and F grades and withdrawals than either of the Non-SI groups ($p < .05$).

It is clear that motivation alone does not account for all of the differences between the SI and Non-SI students for the measures investigated. There are significant and substantial differences between the SI Group and the Motivational Control Group in course grade and in percent of unsuccessful enrollments. These data support further investigation. These preliminary data suggest that less than half the difference in performance between SI and Non-SI groups may be attributed to motivation; more than half is explained by SI participation. Motivational control data was not collected from other institutions due to the considerable effort and commitment required from those institutions.

**Table 3: SI UMKC Data: Spring 1991 (N=644)
Comparison of SI Group, Non-SI (Motivational Control) Group, and Non-SI (All Others) Group**

Student Group	Number of Students	Percent A & B Final Course Grade	Percent D,F,&W Final Course Grade	Final Course Grade
SI-Participant	209	44.5%*	16.7%*	2.45**
Non-SI (Motivational Control)	194	34.5%*	34.5%*	2.13**
Non-SI (All Others)	241	26.3%*	51.1%*	1.90**

*Level of significance of difference: 0.05 using chi-square test. **Level of significance of difference: 0.01 using independent t-test. Data from other institutions that have implemented SI.

Academic achievement for students from across the U.S. who were SI-participants.

Nearly one hundred colleges and universities submit data reports annually on their SI programs. The following table was compiled from different types of institutions. A sample was selected for analysis. They were selected since: they had a sufficient number of SI's in place; had sufficiently rigorous data collection procedures; had transmitted their data to us in a timely fashion; they represented a cross section of institutions. These findings are similar to the findings from the UMKC campus: SI-participants received a higher final mean course grade ($p < .01$) and a lower percentage of D and F final course grades and withdrawals ($p < .05$).

Table 4: SI National Field Data: 1982 to 1991 (N=49 Institutions; 1,477 SI Courses)

Type of Group	All Institutions N=1,477		Two Year Public N=126		Four Year Public N=1,071		Four Year Private N=267	
	Percent D,F, or W	Course Grade	Percent D,F, or W	Course Grade	Percent D,F, or W	Course Grade	Percent D,F, or W	Course Grade
SI	23%*	2.46**	24%*	2.64**	23%*	2.37**	19%*	2.54**
Non-SI	38%*	2.12**	41%*	2.31**	35%*	2.07**	32%*	2.27**

*Level of significance of difference: 0.05 using chi-square test. **Level of significance of difference: 0.01 using independent t-test.

Increased Rates of Persistence and Graduation Rates

Students participating in SI persist at the institution (reenrolling and graduating) at higher rates than students who do not participate in SI.

Research suggests that SI makes a positive difference in terms of increased reenrollment and college graduation (Tables 5 and 6). The studies only consider UMKC students since other institutions have not yet reported on their own persistence studies. The reenrollment rates were significant at the $p < .05$ level and the graduation rate was significant at $p < .01$.

Students who participate in SI reenroll at the University at a rate ten percentage points higher than non-participating students. This difference holds true whether the students score in either the top or bottom quartile of college entrance tests. The freshmen who participated in SI during Fall 1983 had graduated by Fall 1989 at a rate 12.4 percentage points higher than non-SI participating students (30.6% versus 18.2%). The difference was statistically significant at $p < .01$.

Table 5: Reenrollment Rates of UMKC Students Enrolled in SI Courses, Fall 1989 (N=1,689)

Group Composition	Number Students	Mean High School Rank Percentile	Reenrollment, Spring 1990
SI-Participant, Fall 1989	479	72.4	90.0%*
Non-SI Participant, Fall 1989	1,210	72.0	81.5%*

*Level of significance of difference: 0.05 using chi-square test.

Table 6: Graduation Rates of Fall 1983 UMKC First-Time, First-Year Students Cumulative Graduation Rate By End Of Four Time Periods

	By Summer 1987	By Summer 1988	By Summer 1989	By Fall 1989
SI Participant	19.4%**	25.8%**	28.2%**	30.6%**
Non-SI Participant	9.3%**	15.1%**	17.8%**	18.2%**

**Level of significance of difference: 0.01 using chi-square test. Includes all 349 UMKC First-Time, First-Year Freshman who were not enrolled in professional degree programs. SI participants = 124. SI was offered in 12 courses during Fall 1983.

Effectiveness with Students of Differing Academic Preparation

Despite prior academic achievement, students participating in SI within targeted high risk courses succeed at a higher rate than those who do not participate in SI.

Data analysis was performed to determine the utilization and effectiveness of SI services for students of differing previous academic achievement. Previous academic achievement was defined as high school percentile rank and mean composite score on a college entrance exam (e.g., American College Testing service). Students were divided into quartiles on the basis of their mean composite ACT score as compared with other UMKC students.

These data warrant the following observations. Students in the bottom quartile group used SI services at nearly the same rate as did students in the top quartile (Table 7). Despite quartile ranking, SI-participating students earned significantly higher grades than their non-participating counterparts. SI-participating students in the bottom and middle two quartiles reenrolled at the institution at significantly higher rates than their non-participating counterparts. Both the SI and Non-SI groups of the top quartile reenrolled at 93 percent. However, the Top Quartile SI-participants received a significantly higher mean final course grade.

It is noteworthy that SI services appear to meet the needs of students with a wide range of previous levels of academic achievement within the same group setting, thus reducing the necessity for the institution to provide additional and separate tutorial programs.

Table 7: UMKC Students of Differing Levels of Previous Academic Achievement: Fall Semester 1989 to Winter Semester 1990 (N=1,628)

Group Composition	Number of Students	Percentage of Students in Targeted Classes	High School Percentile Rank	Mean Composite ACT Score	Percentage Reenrolled Following Semester	Final Course Grade
Top Quartile, SI	112	32.9%	87.5	26.8	92.9%	3.29**

Group Composition	Number of Students	Percentage of Students in Targeted Classes	High School Percentile Rank	Mean Composite ACT Score	Percentage Reenrolled Following Semester	Final Course Grade
Top Quartile, Non-SI	288	67.1%	82.1	27.0	93.1%	2.83**
Middle Two Quartiles, SI	262	27.6%	68.7	21.3	90.5%*	2.67**
Middle Two Quartiles, Non-SI	687	72.4%	67.7	21.4	77.9%*	2.28**
Bottom Quartile, SI	104	30.7%	64.9	15.1	85.6%*	2.10**
Bottom Quartile, Non-SI	235	69.3%	63.5	15.7	77.9%*	1.77**

*Level of significance of difference: 0.05 using chi-square test. **Level of significance of difference: 0.01 using independent t-test.

Effectiveness with Students of Differing Ethnicities

Despite ethnicity, students participating in SI within targeted high risk courses succeed at a higher rate (withdraw at a lower rate and receive a lower percentage of D or F final course grades) than those who do not participate in SI.

In a recent national research study of 13 institutions, non-Caucasian ethnic students who participated in SI earned higher final course grades than their non-participating counterparts. Non-Caucasian ethnic group students were found to participate in SI at a rate equal to or higher than Caucasian students. Whether the non-Caucasian students were from the top or bottom quartile of their ACT test score group, the SI-participating students earned at least a half-grade higher final course grade than their counterparts. With the increased concern for diversity on campus, it is important to note that SI is helpful to all students, regardless of their ethnic background.

Two research questions were examined: 1) How well did SI serve minority students? and 2) How well did SI serve students at both ends of the academic spectrum?

Thirteen institutions participated in the study. The subjects in the study were 2,410 students in classes where SI was offered during Winter and Fall, 1987. Of the students, 299 (12.4%) were minority. The following data were provided for each

student in the study: race, standardized entry test scores, number of times attending SI and final course grade.

A sample of 13 institutions was selected for analysis. The institutions were selected since: they had numerous SI's in place; had sufficiently rigorous data collection procedures; had transmitted their data to us in a timely fashion; they represented a cross section of institutions (3 two-year public; 4 four-year private and 6 four-year public). Of the 2,410 participants in the study, 2,111 were Caucasian and 299 (12.4%) were non-Caucasian.

Data permit the following observations: students in each Non-Caucasian ethnicity used SI services at equal or higher rates than Caucasian students (Table 8). Despite quartile ranking (Table 9), Non-Caucasian SI participating students earned higher grades than their non-participating counterparts ($p < .01$). Non-Caucasian SI participating students (Table 9) received a lower percentage of D and F final course grades and withdrawals ($p < .05$) than their non-participating counterparts.

It is noteworthy that SI services appear to meet the needs of students with a wide range of previous levels of academic achievement and ethnicities within the college courses, thus reducing the necessity for the institution to provide additional and separate tutorial and academic support programs.

Table 8: Participation in SI by Differing Ethnicities: 1987 (N=13 Institutions; 2,410 SI Participants)

Caucasian	African-American	Hispanic	Asian/Pacific	Native American
33.8% (2,111)	42.0% (174)	50.9% (55)	33.3% (42)	42.9% (28)

Table 9: Effectiveness of SI with Differing Ethnicity and Levels of previous Academic Achievement: Spring and Fall 1987 (N=13 Institutions, 299 Non-Caucasian Students)

Group Composition	Percent D, F, & W		Mean Final Course Grade	
	SI	Non-SI	SI	Non-SI
All Minority	36%*	43%*	2.02**	1.55**
Lowest Quartile, Minority	Not collected	Not collected	1.87**	1.35**
Highest Quartile, Minority	Not collected	Not collected	2.64**	1.97**

*Level of significance of difference: 0.05 using chi-square test. **Level of significance of difference: 0.01 using independent t-test.

Academic achievement of African-American students.

This study describes the academic performance of all 100 African-American students enrolled in 12 UMKC College of Arts and Science, School of Pharmacy and School of Basic Life Science courses that had SI attached during the 1987 Fall Semester. The data (Table 10) suggests that African-American students using SI when compared with Non-SI students of the same ethnicity: had a significantly lower percentage of D and F final course grades and course withdrawals; and earned a statistically significant higher mean final course grade.

Table 10: Effectiveness of SI with UMKC African-American Students: Fall 1987 (N=110)

Group Composition	Number/Percentage of Students	Percent D, F, or W	Mean Final Course Grade
SI-Participant	39 (35.5%)	31%*	2.20**
Non-SI Participant	71 (64.5%)	46%*	1.80**

*Level of significance of difference: 0.05 using chi square test. **Level of significance of difference: 0.01 using independent t-test.

Long Range Significance of College Graduation

Differences in course grades and attrition rates between SI participants and non-participants have implications for student retention at the University. Students who do better academically are more likely to reenroll at the University during subsequent semesters and graduate than students who do less well (Tinto, 1987; Noel, et. al., 1985).

A college degree is an important economic and social resource for the graduating students. Pascarella and Terenzini's most recent book, How College Affects Students (1991), reviewed and reanalyzed almost 3,000 studies concerning the impact of college on students. College graduates earned between 18.3 to 46.5 percent more than those with only high school diplomas (p. 501). This was true despite ethnicity and gender (pp. 522-527). Besides the economic benefits, Pascarella and Terenzini suggested that there were social and self-esteem benefits as well. "[I]ndependent of an individual's background, a bachelor's degree confers about a 34 percentile point

advantage in occupational status or prestige over and above graduating from high school" (p. 488).

A college degree was also an important economic resource for the community in two ways. The first was that the graduate was more likely to earn more, spend more (recycling the money back into the community) and pay more taxes. The second was that the graduate will have general education skills that are needed to make them more flexible in terms of employability over high school graduates. College graduates are less likely to suffer long-term unemployment and underemployment. This would reduce the need for the state to support them with welfare and unemployment benefits.

We do not say that everyone should try to be a college graduate, but we do say that data suggests that almost everyone could benefit from a college degree. It does appear reasonable to say everybody who could get a college degree and wants to complete a degree, should have access to a college degree. The goal of SI is to provide every opportunity for students to place themselves within the "could" category.

Because of the contributing effects of SI on the continued reenrollment and persistence toward graduation of SI participating students, the institution receives more revenue from these persisters than the financial investment in implementing the SI program. This is an important side benefit of SI during these times of restrictive funding for higher education. The SI program provides a wise investment of limited funds.

References

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