Supplemental Instruction

(SI)

Review of Research Concerning the Effectiveness of SI from The University of Missouri-Kansas City and Other Institutions from Across the United States

By

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Abstract of Supplemental Instruction

Goals, Purpose and Audience for Supplemental Instruction (SI)

The Supplemental Instruction (SI) model of student academic assistance helps students in historically difficult classes master content while they develop and integrate learning and study strategies. Goals of SI include: (1) improve student grades in targeted courses; (2) reduce the attrition rate within those courses; and (3) increase the eventual graduation rates of students. All students in a targeted course are urged to attend SI sessions, and students with varying ability levels and ethnicities participate. There is no remedial stigma attached to SI since historically difficult courses rather than high risk students are targeted.

Some educational researchers (Dimon, 1988; Keimig, 1983) have concluded that it is difficult to teach transferable study skills in isolation from content material, and SI offers an alternative. Experts in higher education have recognized that there is a need for increased emphasis on student retention, particularly for first-generation and economically-disadvantaged students. American society cannot afford the economic and social cost of college drop outs who are not able to fulfill their potential.

Method of SI Operation

SI is attached to specific historically difficult courses. There are four key persons involved with SI. The first is the SI supervisor, a trained professional on the SI staff. The SI supervisor is responsible for identifying the targeted courses, gaining faculty support, selecting and training SI leaders, and monitoring and evaluating the program. Once the historically difficult courses have been identified, the SI supervisor contacts the faculty member concerning SI for their course. The second key person for SI is the faculty member who teaches one of the identified courses. SI is only offered in courses in which the faculty member invites and supports SI. Faculty members screen SI leaders for content competency and approve selections. The third key person is the SI leader. SI leaders are students or learning center staff members who have been deemed course competent, approved by the course instructor and trained in proactive learning and study strategies. SI leaders attend course lectures, take notes, read all assigned materials, and conduct three to five out-of-class SI sessions a week. The SI leader is the "model student," a facilitator who helps students to integrate course content and learning/study strategies. The fourth key member of the SI program are the participating students. SI can be implemented in one course each semester, or in many more. The only difference would be an increase of one additional SI leader for each additional course. An increase of SI leaders would require an increase of SI supervisory personnel. Costs for implementing the program could be covered through various means (e.g., staff release time, work study funds, fee waivers).

History of Supplemental Instruction

SI was created by Deanna C. Martin, Ph.D., at the University of Missouri-Kansas City in 1973. After initially offering SI at the health science professional schools, it was extended throughout the institution. 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. SI is the only program validated by USDOE as improving student academic achievement and graduation rates. The National Diffusion Network (NDN), the national dissemination agency for the U.S. Department of Education, provided federal funds for dissemination of SI until the NDN was discontinued by the U.S. government. National and international dissemination continues. As of December 1997 faculty and staff from 719

institutions across the nation had received training to implement their own SI program. SI is active at an additional 146 institutions in 12 countries (including Australia, Malaysia, New Zealand, South Africa, Sweden, and United Kingdom).

Claims of SI Effectiveness Validated by the U.S. Department of Education
Claim 1. Students participating in SI within the targeted historically difficult courses earn higher mean final course grades than students who do not participate in SI. This is still true when differences are analyzed, regardless of ethnicity and prior academic achievement.
Claim 2. Regardless of ethnicity and prior academic achievement, students participating in SI within targeted historically difficult 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.
Claim 3. Students participating in SI persist at the institution (reenrolling and graduating) at higher rates than students who do not participate in SI.

Description of the SI Program

A. Goals of SI
The three closely-related goals of Supplemental Instruction (SI) are
♦ Improvement of student course grades
♦ Reduction of attrition rates in historically difficult college courses
♦ Student persistence toward graduation.
   SI accomplishes these purposes by using the process of cooperative/collaborative learning to integrate instruction in learning and reasoning skills with a review of the course content of selected courses.

B. Purposes and Needs Addressed by SI
   Supplemental Instruction (SI) was developed as an academic assistance program in response to a high rate (40 percent) of student attrition. An examination of student records revealed that attrition is highest in the first six weeks of the first year student academic term (Noel et. al., 1985). Furthermore, entry profiles did not necessarily predict students who were at risk of dropping out. Special features of the SI program are:

(1) The emphasis in SI is on historically-difficult courses (those classes with a 30 percent rate of grades of D, F, and Withdrawals) rather than high-risk students. In this way, the program avoids the remedial stigma often attached to traditional academic assistance programs. SI is open to all students in the targeted course; therefore, pre-screening of students is unnecessary. The program also provides academic assistance during the critical first six-week period of class. SI is often attached to high-risk courses that serve first and second-year students, however, each institution may develop its own definition of "high-risk courses."

(2) The SI leader is a facilitator, not a mini-professor. The role of the leader is to provide structure to the study session, not to re-lecture or introduce new material. The SI leader is a "model student" who shows how successful students think about and process the course content. Collaborative learning is an important strategy since it helps students to empower themselves rather than remaining dependent as they might in traditional tutoring. Research suggests those

tutoring relationships do not promote transfer of needed academic skills (Dimon, 1988; Martin, et. al., 1994, 1992, 1983, 1977).

(3) SI focuses on both <u>process</u> and <u>content</u>. Therefore, learning/study strategies (e.g., note-taking, organization, test preparation) are integrated into the course content during the SI sessions. SI sessions provide immediate practice and reinforcement of these acquired skills. SI collaborative sessions capitalize on the use of the "teachable moment" to apply the learning strategies to the course material.

Nationally, high student attrition among first year college students continues to be a trend (American College Testing Program, 1999). Tinto (1987, p. 1) predicted that of the nearly 2.8 million students who entered higher education for the first time, more than 1.8 million will leave without receiving a degree. Tinto, regarded by many as the expert in student retention in post-secondary education, has identified significant factors in the dropout of students (1989, p. 47). Many students felt socially isolated on campus. Students had difficulty in adjusting to the new environment. Students suffer from incongruence (i.e., they were not able to link the knowledge received from class lectures to what they already understood). The final factor was that students had difficulty in the college environment. The SI program can be part of a broad institutional response to help address these four problems. The SI review sessions provide a safe environment for students to discuss and process the course material. Students in SI become acquainted with each other as they interact. The SI leader facilitates the discussion so that students can make adjustments, discuss what they do not understand and discover strategies for mastering difficult material.

C. <u>Intended Audience for SI</u>

SI targets "historically difficult" courses rather than high-risk students. At many campuses historically difficult 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 of 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. Despite academic discipline or grade level, SI has been effective. This history of success with SI in upper division courses is important because some institutions implement SI to retain first-generation and low-income professional school students. Each institution can adjust the definition of "historically difficult courses" to meet their own institutional objectives and needs. SI is effective with students from a variety of ethnic, economic and academic preparation backgrounds.

The following are departments within the College of Arts and Sciences or professional and graduate schools where SI has been offered at UMKC (Number Inside Brackets Represents Number of Different Courses): Art [1]; Biology [3]; School of Business [3]; Chemistry [6]; School of Dentistry [1]; Economics [2]; Foreign Language [3]; History [6]; English [2]; School of Law [5]; Mathematics [3]; School of Medicine [3]; School of Pharmacy [2]; Philosophy [1]; Physical Science [1]; Political Science [2]; and Sociology [2]. SI Programs from other institutions report its use in similar areas and other disciplines.

Courses are designated as "historically difficult" if there is a continuous record in preceding semesters that students receive a high percentage of D or F final course grades or withdrew from the course. The purpose of attaching SI is to assure that the course is no longer difficult for a large number of students. It does not, however, lose its "historically difficult" status for services. Once the D, F and withdrawal rate has been reduced, the SI service is continued since nothing has been done to change the course <u>per se</u>. Data suggests that when SI was not provided for the course (e.g., cannot find a suitable SI leader), the D, F and withdrawal rate returns to the original baseline. The only condition under which a decision is made to discontinue SI is when a change of course instructor results in uniformly higher grades and, subsequently, lower levels of student participation in SI. The campus SI supervisor continuously monitors 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 "historically difficult" course relates to a single factor: the percent of students who complete the course successfully. It is 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. The critical factor is that students have academic difficulty. SI reduces that difficulty. There is no claim that SI addresses every need.

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 suggests 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)

Schreiner, 1990

The goal of the SI program is not to evaluate the curriculum or instructional delivery of the course professor, but to help the enrolled students perform satisfactorily in traditionally difficult courses. Other institutions, however, sometimes have other concerns (e.g., curriculum reform, improved instruction). Some institutions have addressed these issues with the introduction of SI. While SI does not meet every student's needs, it is a delivery system that is flexible enough to meet many students' needs.

D. <u>Background, Foundation and Theoretical Framework for SI</u>

Research and writing in intellectual development (Piaget, Dale, Arons, and Perry) and in college student development and retention (Pascarella, Tinto, Astin, Light, Noel, and Levitz) support the

empirical framework upon which SI is based. Students "who form study groups report that they both enjoy their work more, and feel they learn more, because of the academic discussions within these groups" (Light, 1990, p. 18). "In every comparison of how much students learn when they work in small groups or when they work alone, small groups show the best outcomes" (Light, 1990, p. 10). Such experiences improve both the cognitive and affective domains of the students (Sandberg, 1990). Astin (1987) cited collaborative learning as an important tool for teaching students how to work together before they enter the work world. "The student's peer group is the single most potent source of influence on growth and development during the undergraduate years" (Astin, 1993, p. 398).

Keimig (1983) developed a "Hierarchy of Learning Improvement Programs." Lowest ranked were remedial courses that taught skills in isolation. The second from the bottom was tutoring since it generally was used after academic difficulty or failure had been experienced. Using Keimig's model, programs similar to SI were ranked near the top of the effectiveness scale since, " . . . students' learning needs are presented as being necessary because of the nature of the objectives and content of the course rather than because of student's deficiencies. Therefore, all students have access to supplementary . . . instructional experiences, which benefit nonremedial students as well (Keimig, 1983, p. 23)."

Since there are no students who are pretested into the SI program, and since SI is open to all students in the targeted class, students are not subjected to a remedial stigma. "One way of integrating all students is to make sure our learning communities are open communities" (Tinto, 1990, p. 22). Despite the student's previous academic success, SI sessions are designed to benefit everyone. "Successful institutions know that ultimately student retention is a by-product of student success and satisfaction" (Noel, Levitz, & Saluri, 1985, p. xiii). Rigorous evaluation suggests that SI helps to provide that success and satisfaction. Effective assistance is particularly important during the first year of college when students need "front-end" academic support (Upcraft, Gardner, & Associates, 1989). The SI model uses collaborative learning (Johnson, et al., 1991; Tomlinson, 1989; Whitman, 1988). SI leaders are trained in proactive learning strategies. The SI model is well represented in the professional literature based on an annotated SI bibliography of more than 330 citations (Arendale, 1997).

E. Features: How the SI Program Works

(1) Scope: Academic assistance programs exist on almost all college campuses today. These programs may include special counseling and academic advising, one-on-one tutoring, remedial or developmental courses and study skills courses. The central purpose of these programs is to support and retain students. Sometimes, SI supplements these offerings; in others, SI replaces one or more components of an existing academic assistance program. In either case, the addition of SI serves to enhance the total campus retention effort. Besides the previous definition of a historically difficult course (30 percent of students receive a D or F final course grade or withdraw), at UMKC these courses would include one or more of the following characteristics: large in size; mostly lecture with little opportunity for question/answer; or a "gatekeeper" course that must be passed before the student can enter an academic degree program.

(2) Curriculum and instructional approach: SI sessions are structured to maximize active student involvement with the course material. The SI leader neither relectures nor introduces new material. Instead, the SI leader guides students in using their own class notes and reading materials

to help students clarify course concepts. Although the SI leader provides structure and guidance, the responsibility for processing course material remains with the students.

Although faculty members who teach courses targeted for SI are very supportive and involved in the program, they do not receive information regarding the names of their students that participated. While the faculty member is welcome to observe occasionally the SI session, they are not encouraged to make it a regular practice. The SI supervisor must be sensitive to the possibility that some professors may be unintentionally biased with scoring examinations and awarding final course grades based upon student participation in SI.

It is important to ensure that SI not only avoids being viewed as remedial, but also avoids being labeled as compensatory. The incentive for students to participate in SI is increased academic performance. At UMKC, the staff feels it is important that students not receive extra credit for attending SI. Not all students can attend SI due to conflicting class or work schedules and family duties. Nor can all afford the additional tuition expense.

(3) Learner activities: At least three or more hours of SI are available each week per course. During the SI session, the SI leader models application of study strategies such as note taking, graphic organization, questioning techniques, vocabulary acquisition, and test prediction and preparation. Students learn to trust each other to verbalize what they do understand and clarify what they don't understand. At the beginning of the semester, the SI leader provides the structure for the study session. However, as the semester progresses, the students assume responsibility for the structure by creating informal quizzes, visual models, note cards or time lines, brainstorming, designing paired problem solving activities or predicting test questions. This is a powerful use of collaborative learning strategies.

(4) Learning materials: Students come to the SI session with their course notes, textbooks, and course handouts. The SI leader may occasionally provide a work sheet as part of the planned structure for the session. The SI group itself, however, becomes the primary learning resource as students clarify and add to each other's knowledge base through discussion and problem solving. During training, adopters receive a SI supervisor's Handbook. This handbook helps the supervisor in all phases of implementing the SI program. The SI supervisor receives a training notebook to give to SI leaders. Additional resources include monographs related to SI, video tapes related to SI training and management, various survey forms, and supplemental materials.

(5) Staff activities and staffing patterns: The SI program is administered by a professional staff member (e.g., a faculty member, learning skill staff). SI supervisor duties include: selecting courses targeted for SI; gaining faculty approval and support; identifying SI leaders; training SI leaders; evaluating the performance of the SI leader; collecting data on the SI program; and analyzing and reporting the results of the program. SI leaders are usually students who have previously taken and performed well in the targeted class. Sometimes learning center staff members, other students or community members conduct SI. The faculty member, however, must approve the leader as content competent. The SI supervisor assesses the SI leader's communication skills, time restrictions and attitude. Once selected, the SI leader must: attend twelve hour training course; attend all sessions of the targeted class and take notes; complete all assigned readings for the targeted course; schedule and conduct at three or more SI sessions a week during the semester; provide a plan for the SI session using the strategies learned in training; and attend regular meetings with the SI supervisor. Successful SI sessions occur when the SI leader

is able to facilitate the group so that students are the ones who generate the answers to questions raised during the sessions.

(6) Staff Development Activities: SI supervisors attend a three and one-half day training workshop that cover the areas of implementation and management, training, supervision, evaluation, and study strategies. Four workshops are hosted at UMKC each year. Upon request, additional workshops are conducted in the field throughout the year by the UMKC staff and its Certified Trainers. Follow-up technical assistance is provided by telephone or occasional requested site visit. The UMKC staff follow up all adopters with telephone calls and a newsletter. Continued professional development is available through professional development seminars hosted by UMKC and through special interest groups dedicated to SI that is offered at several national educational conferences and at UMKC each year. SI leaders begin their development with twelve hour training workshop held by the SI supervisor before the beginning of each semester. Continued training is conducted at regular meetings scheduled by the SI supervisor. Informal training occurs because of the supervisor's observation of the SI leader conducting a session. Feedback and specific suggestions for improvement are given to the SI leader then. This observation by the SI supervisor is more frequent at the beginning of the semester.

(7) Management Activities: Data are collected from all targeted courses and form the basis of the end of the semester report. Adopting schools are encouraged to send these reports to UMKC regularly. If a report form suggests unsuccessful implementation, technical assistance from UMKC is provided via the telephone.

  For the first two weeks of the semester, SI leaders are observed by their SI supervisor during SI sessions. After that, the SI supervisor will observe a SI session approximately every two weeks throughout the rest of the semester. The SI supervisor holds SI leader staff meetings every two to three weeks to receive informal feedback, discuss problematic areas and collect roll sheets and any handouts that have been generated by leaders for their SI sessions. Other campus programs across the nation report that they meet with their SI leaders once a week and others meet less frequently.

  At the end of Fall, 1991, the "student assistant SI supervisor" was made an official part of the SI model. In the past, UMKC has had only professional staff members serving as SI supervisors. Due to the expansion of the number and types of courses covered by SI at UMKC, the decision was made to hire a student who had been a SI leader for several semesters to serve in a supervisory role. This replaced the need to hire an additional professional staff member. This practice of hiring students to help the SI supervisor was originated by the SI Program supervisor at the University of Louisville when the SI program grew beyond the supervisory time available from the professional staff. UMKC decided to test this approach at UMKC and hired the first student assistant SI supervisor during Spring, 1991. This has been very successful. The critical qualities needed in the student assistant is a successful record as a SI leader themselves and their maturity to objectively observe, supervise and manage other SI leaders. When UMKC receives telephone calls from SI supervisors asking about how to remedy the problem of supervising an expanding program, the student assistant SI supervisor is suggested. This is another mechanism for keeping the program cost effective. Also, students seem to like the opportunity to move up to a supervisory position after serving for several semesters as a SI leader. This builds a career ladder within the SI Program that may attract and retain some leaders.

F. Significance of SI Program Design as Compared to Similar Programs

There are several key elements of SI that differentiate it from group tutoring and other forms of academic support: the SI program is attached to specific courses that are historically difficult for students; participation in the SI program is voluntary; the SI leader attends all targeted course sessions; the SI leader is trained in specific teaching/learning theory and techniques before the beginning of the term; the SI program is supervised by a trained professional staff member; the program is offered only in classes in which the faculty member invites and supports SI; the SI leader facilitates and encourages the group to process the material rather than acting as an authority figure who lectures to participants; and the program is evaluated rigorously.

A major difference between SI and other forms of collaborative learning is the role of the SI leader. Rather than forming study cluster groups and then releasing them in an unsupervised environment, the SI leader is present to keep the group on task with the content material and to model appropriate learning strategies that the other students can adopt and use in the present course other ones in future academic terms (Dimon, 1988; Johnson, et. al., 1991).

Potential for Replication of the SI Program

A. Settings and Participants (Development and Evaluation Sites)

Over 300 institutions currently use SI. Table 2 summarizes 719 U.S. institutions that either planned or implemented the SI program. An additional 146 institutions abroad have received training as well.

Table 2: SI Adoption Sites by Regions in the United States: January 1982 to December 1997

Time Periods	Regions in the United States					
	East	Midwest	Pacific	South	West	Total
1982		1			2	3
1983		2			1	3
1984		2	1	2		5
1985*	19	26	7	5	12	69
1986	15	23	2	5	4	49
1987	14	18	12	11	3	58
1988	35	10	1	8	3	57
1989	18	30	5	1	4	58
1990	7	21	16	4	8	56
1991	18	20	5	3	4	50
1992	24	10	7	12	4	57

Time Periods	East	Midwest	Pacific	South	West	Total
1993	14	19	8	9	10	60
1994	5	8	3	13	5	34
1995	14	18	2	15	6	55
1996	15	18	6	12	9	60
1997	16	8	4	12	5	45
Total	214	234	79	112	80	719

East = CD, DC, DE, MA, MD, ME, MI, JN, NY, OH, PA, RI, VT, WV; Midwest = IA, IL, IN, KS, MI, MO, MN, NE, MD, OK, SD, WI; Pacific = AK, CA, ID, NV, OR, WA; South = AL, AR, FL, GA, KY, LA, MS, NC, SC, TN, VA; West = AZ, CO, MN, MT, NM, TX, UT, WY
* In 1985 UMKC began receiving funds from the USDOE National Diffusion Network for national dissemination activities. The USDOE funds ended in 1996 when the federal department within USDOE was eliminated due to budget cuts.

More than 1,600 individuals have been trained as SI supervisors since 1982. This does not include the number of student SI leaders that have been trained each semester on the campuses using the SI program. The average number of SI targeted classes on each campus is 15. The number of students impacted by the SI program nationally each semester is approximately 300,000. Individual programs are assessed through the SI reporting method. Nearly 100 programs each year submit reports concerning the implementation of SI at their home campuses. In addition, each year UMKC conducts a telephone survey to assess the status of the SI program at each adopting site. The results of this survey show that adopting institutions continue to maintain and build their SI programs.

B. Resources Available from UMKC to Help Institutions Implement SI
UMKC is well equipped to respond to requests for SI awareness materials and training. Besides printed materials, the UMKC staff and Certified Trainers provide video tapes for awareness and training purposes. Twelve Certified Trainers are located throughout the U.S. They have completed the SI supervisor training, implemented successful programs on their own campuses and completed additional training to become Certified Trainers. Although UMKC serves as the main demonstration site, all Certified Trainers and most active SI supervisors host interested visitors at their campuses. The SI supervisor's training handbook has been updated and expanded to 150 pages in length. UMKC has eight training or awareness videos available for dissemination. Evaluation of these products, presentations, and training workshops by users is consistently in the outstanding range on a Likert scale. New research findings from the UMKC site and from SI supervisors in the field are disseminated throughout the SI network via a quarterly newsletter.

C. Requirements for Successful Implementation of SI
To estimate the cost of implementing SI at an institution, three factors needed to be considered. First, will the institution need to employ new personnel to implement the program, or can it use existing personnel? Second, will the SI supervisor need assistance from other personnel? Third, what types of support will be forthcoming from the adopting institution in terms of release time and use of facilities? Despite the number of SI's to be implemented, one person from the institution needs to go through the three and one-half day training workshop with the UMKC staff

or one of its Certified Trainers. The SI supervisor needs to have release time for each SI that they will supervise. The time commitment required of the SI supervisor will vary over the course of the semester. During the first two weeks of the academic term, the SI supervisor attends all lectures in the targeted course and all SI sessions. After this first intensive period, the SI supervisor's time commitment diminishes.

When a new SI program is being implemented on a campus, it requires more time than when the program is established. When starting up the program, the SI supervisor will need to work more intensively with faculty members, administrators and other staff members. UMKC finds that during the first two weeks of the semester it takes about six hours per week to supervise each class where SI is offered. During this initial intense period in the semester, a person could not be expected to supervise more than seven classes where SI was being offered. This is the reason UMKC recommends that institutions only begin with a few sections of SI in order for the SI supervisor to become comfortable with implementing the program. There is an economy of scale as the program grows larger; therefore, it is not necessary for the administrative support to grow at the same rate. Also, the introduction of the "student assistant SI supervisor" has also provided a cost-effective strategy to manage the time and expense with administering a SI program.

Data gathered through reviewing individual program reports and a telephone survey suggests that SI leader salaries vary greatly by institution. If a SI leader is paid hourly, their preparation time and their time in the SI session are documented. A small private community college in New York is currently offering two SI's a semester and pays a minimum wage, $4.25 an hour. A medium sized college in New Jersey pays $7.25 an hour and manages approximately ten SI's a semester. A large public university in Utah offers $4.50 to $6.00 an hour and conducts 200 SI's yearly. It appears that the mean wage for SI leaders is approximately $5.50 per hour. Other institutions prefer to offer a semester stipend. UMKC's SI leaders are paid $850 to $950 each semester (higher pay for returning SI leaders). A medium sized college in Illinois classified their SI leaders as equivalent in status to laboratory assistants on their campus and pays them $2,000 per semester. SI leaders are not always rewarded with a salary. A medium size university in Kansas rewards their SI leaders by giving them academic credit from their school of education.

D. Costs for Implementation and Operation of the SI Program

During the 1980-81 academic year, UMKC provided SI services to 566 students in 10 courses at a cost of $34,500; an average cost of $60.95 per student. The total program costs increased in FY 1997-98 since SI was offered in 51 courses, additional supervisory personnel were required and wages had increased since 1980. However, the average cost per student had decreased to $46.89 since more students were served (1,700) and increased reliance was made of student assistant SI supervisors. Personnel costs include salaries for a full-time SI supervisor, a student assistant SI supervisor, part-time secretarial assistance, and SI leaders ($1,100 per course is the UMKC rate). However, these are variable costs since some institutions might have other ways to cover them. If a preexisting academic support program with full-time staff is already in operation on a particular campus, the program could be installed at a considerably lower cost. SI leaders can be paid through work-study, academic credit, partial tuition waiver, preexisting tutor budget, or other means. The program costs would vary by the number of SI courses and the rate of pay for SI leaders.

Longitudinal research studies suggest that SI increases both re-enrollment and graduation rates. (Please see data tables #8, #9, and #10). The following rationale illustrates the use of SI to increase enrollment and revenue.

1. During FY 1998-99, SI operated in 52 content courses. These 52 courses had a total enrollment of 4,110 students. Of these students enrolled in the course, 48.9 percent of these 4,110 students (2,010 students) attended one or more SI review sessions during the semester.
2. Students who attended SI review sessions at UMKC re-enrolled and graduated at a rate ten percentage points higher than students who never attended SI review sessions. (See data tables #8, #9, and #10). Research conducted by the SI staff at UMKC suggests that the learning strategies and critical thinking skills students develop through SI are transferred to future academic work.
3. Applying the ten percent point difference between students who attended SI review sessions with students who never attended, one can infer that last year 201 students re-enrolled at UMKC that otherwise would have dropped out. (2,010 students x 10% = 201)
4. Minimally, the average undergraduate student (12 credit hours) spends $3,300 each year on tuition, fees, bookstore purchases and other related expenditures. Those 201 students provide $663,300 in additional revenue. ($3,300 x 201 = $663,300) Full time students in the professional schools average $5,000 in annual expenditures.
5. Each year new groups of first-year students attend SI sessions. Taking only the last four years, 6,768 students have attended SI. As mentioned above, research suggests that nearly ten percent of students would have dropped out of the University had they not attended SI review sessions. Thus, some 677 additional students are now in the pipeline due to SI participation.
6. The economic impact of SI for these 677 additional students is considerable. With a minimal expenditure of $3,300 each year in tuition, fees, and other expenditures, the aggregate yearly impact is $2,234,100. This only assumes that the student persists for one additional year in school. The yearly impact would be much higher if the student persisted longer than just one additional year, especially if they graduated from the institution.

   The economic impact with graduate and professional school students would be considerable since they are full-time and pay higher fees. Because of the nature of the curriculum which tracks cohorts of students through the academic program, students who withdraw after the first year in their program cannot be easily replaced by new students. The lost revenue from these empty seats in the cohort of students would continue until the entire group graduated from their program.

Evidence for Supporting SI Claims of Effectiveness

A. Claim Statements of SI

Claim 1. Students participating in SI within the targeted historically difficult 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.

Claim 2. Despite ethnicity and prior academic achievement, students participating in SI within targeted historically difficult 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.

Claim 3. Students participating in SI persist at the institution (reenrolling and graduating) at higher rates than students who do not participate in SI.

B. Description of Methodology of Research Studies for Each Claim Statement

1. Design

The basic design of the various quasi-experimental research studies compares performance of the voluntary treatment group (SI Participants) with the control group (Non-SI Participants). Studies include one or more of the following independent variables: motivation to participate; college entrance standardized test scores, high school percentile rank, prior academic achievement; ethnicity; and frequency of SI attendance. Studies include one or more of the following dependent variables: final course grades; percent A & B final course grades; percent D & F final course grades and course withdrawals; reenrollment rates; and graduation rates. All final course grades were based on a 4.0 grade scale (4=A; 3=B; 2=C; 1=D; 0=F). The research does meet the standards for quasi experimental design and results have been replicated across many institutions. Initial research designs were jointly developed by the Center and officials from the U.S. Department of Education.

For the foregoing analyses, all students within the targeted SI courses are included, both those enrolled in UMKC and those enrolled in other institutions where SI has been adopted and evaluative data have been collected. The first six sets of studies use data from the UMKC program: historical data (Table 3); disaggregation of data by motivational control group (Table 4); disaggregation of data by prior academic achievement (Table 5); disaggregation of data by ethnicity (Table 6); frequency of SI attendance upon mean final course grade (Table 7); and longitudinal follow-up (Tables 8, 9 and 10). Two sets of studies contain data from other institutions that have implemented SI: cross-institutional (Tables 11, 12, and 13); and disaggregation of data by ethnicity (Tables 14 and 15).

2. Population

The population studied for this report includes all students enrolled in courses in which SI was offered, those who participated in SI and those who did not. The population for these studies represent students from UMKC and from other institutions in the U.S. where SI has been adopted and accurate data collection efforts have been made. Within this population are two subgroups: those enrolled at the University of Missouri-Kansas City and students enrolled at institutions at other locations in the U.S.

Since a definition of SI participant is required, for the purpose of these studies a SI participant is defined as someone who participates in one or more SI sessions during an academic term. There is not an assumption that attendance at a single SI session might affect performance. Rather, SI was originally designed to counter the tendency of students to withdraw from specific courses after the first six weeks of class, a time which generally corresponds to the first mid-term examination. The SI program was originally designed to reduce the number of such withdrawals, which is included in the definition of "unsuccessful enrollment" (i.e., final course grades of D or F and course withdrawal). Setting a threshold of attending 3, 5, or more sessions as the minimum to achieve "SI status" would effectively assign all withdrawals who attended fewer SI sessions to the Non-SI group and would substantially (and probably erroneously) magnify the difference in persistence between SI and Non-SI groups. The determination was made, therefore, that a student who withdrew from a class and had attended even a single SI session would be counted among the SI group. This provides a conservative definition of SI membership.

3. 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 that UMKC has recommended. However, all reported their data gathering procedures and evaluators included in the study data which they deemed sufficiently precise to meet minimum standards.

4. 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 receives 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.

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

6. Limitations

This document contains a collection of studies. Some are focused on a single academic course at UMKC. When possible, all available independent variables were included for analysis. Other studies review the effects of SI in a variety of courses at one or more institutions. For some of these studies additional independent variables were unavailable. In those studies the researchers recognize the possible impact of the following variables on the research results: different institutions; different types of institutions; different academic courses; different instructors with different criteria for assigning grades; students with different abilities in the groups; and different SI leaders. While some studies do contain the aforementioned limitations, it should be noted that the replication of similar results (higher academic achievement) across the groups (i.e., different

institutions, different courses) can be considered as another means to validate the educational efficacy of SI.

C. Description of Results Regarding Data Studies for Each Claim

Data from UMKC.

Study #1: Academic achievement for UMKC students enrolled in SI courses.

Table 3. Since 1980, UMKC has offered SI in 525 courses at the undergraduate, graduate and professional school level. Variables in this study are final course grades in classes that have SI attached to them and the rate of participation in SI. The data has been collapsed into a grand mean regarding the final course grade. The data suggests use of t-test and chi square.

Table 3: SI UMKC Data: FY 1980-81 to 1998-99
(N=525 SI Courses; 19,962 SI-Participants; 31,368 Non-SI Participants)

Year	SI Participation Status	SI Participation Percent/Number	Number of SI Courses	Percent A & B	Percent D, F, & Withdrawal	Final Course Grade
1998-1999	SI Non-SI	48.9% (2,010) 51.1% (2,044)	52	54.4%* 42.9%*	20.2%* 33.8%*	2.70** 2.43**
1997-1998	SI Non-SI	39.4% (1,700) 60.6% (2,606)	51	55.1%* 42.8%*	19.0%* 36.5%*	2.65* 2.31*
1996-1997	SI Non-SI	45.4% (1,604) 54.6% (1,929)	47	55.9%* 44.1%*	16.7%* 31.5%*	2.66** 2.35**
1995-1996	SI Non-SI	40.0% (1,454) 60.0% (2,181)	41	52.0%* 37.8%*	21.6%* 39.6%*	2.64** 2.27**
1994-1995	SI Non-SI	36.3% (1,328) 63.7% (2,330)	41	52.6%* 39.6%*	20.8%* 36.0%*	2.84** 2.69**
1993-1994	SI Non-SI	38.1% (1,233) 61.9% (2,003)	40	49.0%* 37.1%*	23.1%* 38.2%*	2.52** 2.18**
1992-1993	SI Non-SI	37.0% (1,287) 63.0% (2,191)	36	55.6%* 41.6%*	20.7%* 37.3%*	2.84** 2.50**
1991-1992	SI Non-SI	39.5% (1,520) 60.5% (2,328)	27	56.4%* 41.5%*	19.2%* 34.1%*	2.69** 2.16**
1990-1991	SI Non-SI	34.1% (774) 65.9% (1,496)	18	53.4%* 38.7%*	16.0%* 31.2%*	2.61** 2.23**

Year	SI Participation Status	SI Participation Percent/Number	Number of SI Courses	Percent A & B	Percent D, F, & Withdrawal	Final Course Grade
1989-1990	SI Non-SI	30.3% (753) 69.7% (1,732)	19	58.3%* 41.9%*	16.7%* 34.8%*	2.70** 2.29**
1988-1989	SI Non-SI	29.9% (614) 70.1% (1,439)	17	63.2%* 45.7%*	15.6%* 28.9%*	2.81** 2.39**
1987-1988	SI Non-SI	34.1% (775) 65.9% (1,498)	24	60.4%* 43.8%*	13.7%* 28.9%*	2.80** 2.39**
1986-1987	SI Non-SI	44.3% (778) 55.7% (978)	19	56.3%* 40.9%*	18.3%* 34.1%*	2.65** 2.41**
1985-1986	SI Non-SI	39.1% (584) 60.9% (910)	16	51.5%* 41.2%*	18.7%* 28.7%*	2.55** 2.34**
1984-1985	SI Non-SI	42.6% (788) 57.4% (1,062)	17	59.7%* 42.9%*	16.8%* 25.4%*	2.83** 2.27**
1983-1984	SI Non-SI	34.1% (765) 65.9% (1,478)	19	54.5%* 39.5%*	17.3%* 29.5%*	2.76** 2.24**
1982-1983	SI Non-SI	43.1% (1,119) 56.9% (1,477)	19	52.2%* 36.8%*	17.9%* 28.2%*	2.51** 2.07**
1981-1982	SI Non-SI	40.9% (329) 59.1% (475)	5	58.2%* 38.5%*	20.9%* 26.7%*	2.61** 2.09**
1980-1981	SI Non-SI	32.2% (566) 67.8% (1,192)	17	50.1%* 32.5%*	14.2%* 33.1%*	2.56** 2.16**

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

Discussion of Table 3. An analysis of data on grades and withdrawal rates 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 3 compared the SI and Non-SI groups. For instance, in 1998-99: 48.9% percent of the students in SI classes participated in SI; SI-participants had a higher percentage of A & B final course grades (54.4% vs. 42.9%), lower percentage of D and F final course grades and withdrawals (20.2% vs. 33.8%) and a higher mean final course grade (2.70 vs. 2.43) than non-SI participants. These results have been replicated each year in a variety of courses at varying levels at the institution. When this data is analyzed for students who attended SI five or more times, there is statistically significant improvements with these comparison measures that favor the SI participants.

2. Study #2: Academic achievement and the possible impact of student motivation.

Table 4. This study examines UMKC students enrolled in classes where SI was offered during Winter Semester 1996. To account for the possible influence of the student motivation level with SI program outcomes, 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 had also indicated high motivation to attend SI on the first day SI survey, the student was assigned to the Non-SI Motivational Control Group.

Table 4: SI UMKC Data: Winter 1996 (N = 1,593)
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 Grades	Percent D,F,&W Final Course Grades	Mean Final Course Grade
SI-Participant	739 (46.4%)	58.9%*	17.2%*	2.78**
Non-SI (Motivational Control)	56 (3.5%)	33.9%*	26.8%*	2.16**
Non-SI (All Others)	798 (50.1%)	42.7%*	38.6%*	2.38**

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

Discussion of Table 4. 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 4. Students using SI services: (A) have significantly higher average course grades compared to both Non-SI groups ($p < .01$) and (b) have considerably fewer D and F grades and withdrawals than either of the Non-SI groups ($p < .05$).

   While it is clear that motivation has some impact on student achievement, motivation alone does not account for the majority 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 both course grade and percent of unsuccessful enrollments.

Study #3: Academic achievement for students of differing previous academic achievement.

Table 5. Data were analyzed to determine the utilization and effectiveness of SI services for students of differing levels of previous academic achievement. Previous academic achievement was defined by 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. The population in this study included all students enrolled in the 19 UMKC classes where SI was offered to all students.

Table 5: 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 Non-SI	112 288	32.9% 67.1%	87.5 82.1	26.8 27.0	92.9% 93.1% n.s.	3.29 2.83**
Middle 2 Quartiles, SI Non-SI	262 687	27.6% 72.4%	68.7 67.7	21.3 21.4	90.5% 77.9%*	2.67 2.28**
Bottom Quartile, SI Non-SI	104 235	30.7% 69.3%	64.9 63.5	15.1 15.7	85.6% 77.9%*	2.10 1.77**

*Level of significance of difference: 0.05 using chi-square test. **Level of significance of difference: 0.01 using independent t-test. n.s. No statistically significant difference between the two groups.

Discussion of Table 5. 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. Despite quartile ranking, SI-participating students earned significantly higher grades than their nonparticipating counterparts. With the top quartile group the SI participants had an average grade of "B" while the non-SI students' overall average was a "C" or "C+". In the bottom quartile group, SI appeared to make a difference between a "C" average and a "D" average. That could have implications regarding placement of students on academic probation. SI-participating students in the bottom quartile and the middle two quartiles reenrolled at the institution at significantly higher rates than their nonparticipating counterparts. While the SI and Non-SI groups of the top quartile reenrolled at 93 percent, the Top Quartile SI-participants received a significantly higher mean final course grade.

   The data suggests 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. While additional research is warranted, other institutions may want to consider this data and replicate the study with research from their own institution when considering whether to provide additional and separate tutorial programs for students from different levels of previous academic achievement.

Study #4: Academic achievement of African-American students.

Table 6. This study examines the academic performance of all 110 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.

Table 6: 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%*	2.2**

Non-SI Participant	71, 64.5%	46%*	1.8**

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

Discussion of Table 6. The data 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 significantly higher mean final course grade. SI appeared to make a difference between a "C" average and a "D" average.

Study #5: Frequency of SI attendance upon final course grade.

Table 7. This study examines the final course grades of all students enrolled in classes that offered SI during Winter Semester 1996 at UMKC. The students were grouped into categories based on the number of times they attended SI: never, one or more times, one to three, four to seven, eight to 11, and twelve or more times.

Table 7: Frequency of SI Attendance Upon
Mean Final Course Grades: Winter 1996 (N = 1,590)

Group Composition	Number Students	Percent A & B Final Course Grades	Percent D, F & W Final Course Grades	Mean Final Course Grade
Do Not Attend Any SI Sessions	854	42.2%	39.3%	2.37
Attended One or More SI Sessions	736	59.1%**	18.2%**	2.79*
Attended 1 to 3 SI Sessions	378	56.3%**	21.4%**	2.77*
Attended 4 to 7 SI Sessions	189	63.0%**	17.4%**	2.82*
Attended 8 to 11 SI Sessions	102	63.7%**	12.8%**	2.88*
Attended 12 or More SI Sessions	67	56.7%**	10.5%**	2.64*

* Level of significant of difference: 0.05 using chi-square test when comparing the baseline non-SI participant group and the individual SI-participant group. ** Level of significance of difference: 0.01 using independent t-test when comparing the baseline non-SI participant group and the individual SI-participant group.

Discussion of Table 7. The data suggests that increased frequency of SI attendance has a relationship with higher final course grades. Astin (1993) suggests that most educational outcomes are dependent upon both the frequency and the intensity of interactions and activities in the college environment. One unexpected result of the research was that if students attended SI sessions twelve or more times, the mean final course grade was slightly lower than other SI attendance groups. However the 12+ attendees received a higher mean final course grade (2.64) than the non-SI attendees (2.37). Interviews with these SI attendees suggest that a large group

were students who had planned to withdraw from the course, but persisted through frequent attendance at SI sessions.

Study #6: Persistence rates of SI-participating students at the institution.

Table 8. This study examines UMKC students who were enrolled in classes that offered SI during Fall 1989 regarding their reenrollment status with the University. The mean high school graduation rank percentile was also included for analysis to see if the two student groups had similar predicted academic strength upon their admission to UMKC. The same students were reexamined at the end of the Winter 1990 semester to reveal whether they were still enrolled/graduated or were not enrolled at the University.

Table 8: 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 n.s.	90.0%*
Non-SI Participant, Fall 1989	1,210	72.0	81.5%*

*Level of significance of difference: 0.05 using chi-square test.
n.s. No statistical difference.

Discussion of Table 8. The data suggests that SI makes a positive difference in terms of increased reenrollment. The reenrollment rates were significant at the $p < .05$ level and the graduation rate was significant at $p < .01$. Educational researchers have often cited academic success as an important factor to eventual college graduation (Tinto, 1987; Noel, et. al, 1985).

Table 9. This study examined UMKC students who were enrolled in classes where SI was offered during the fall academic term between 1989 and 1995. The students were examined again the following fall academic term at UMKC to see whether they had reenrolled/graduated or were not currently enrolled at the University. Researchers postulated that examining students the following year would be a better study for impact of the SI program rather than studying the students the immediate following academic term during the winter semester. The data table disaggregates the follow-up analysis regarding the percent who had graduated, reenrolled, and a total of graduated or reenrolled.

Table 9: Reenrollment & Graduation Rates of UMKC Students
Enrolled in SI Courses: 1989 to 1996

Term SI Offered To Students	Term Examined for SI Impact	Student Group	Number Students	Graduation Percent	Re-Enrollment Percent	Graduation + Re-Enrollment Percent
Fall 89	Fall 90	SI Non-SI	386 923	7.8%* 5.0%	65.3%* 56.7%	73.1%* 61.7%
Fall 90	Fall 91	SI Non-SI	529 1,162	5.9% 8.1%	70.1%* 58.3%	76.0%* 66.4%
Fall 91	Fall 92	SI Non-SI	795 1,085	4.8% 5.3%	70.6%* 63.6%	75.4%* 68.9%
Fall 92	Fall 93	SI Non-SI	639 1,221	8.6% 8.7%	70.6%* 53.6%	79.2%* 62.3%
Fall 93	Fall 94	SI Non-SI	699 1,221	5.2% 8.2%	73.4%* 55.3%	78.6%* 63.5%
Fall 94	Fall 95	SI Non-SI	604 962	4.3% 5.1%	72.4%* 60.8%	76.7%* 65.9%
Fall 95	Fall 96	SI Non-SI	619 940	5.5% 7.3%	74.5%* 58.2%	80.0%* 65.5%

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

Discussion of Table 9. The data suggests that SI makes a positive difference in terms of increased reenrollment and college graduation. The reenrollment rates were significant at the $p < .05$ level and the graduation rate was significant at $p < .01$. Educational researchers have often cited academic success as an important factor to eventual college graduation (Tinto, 1987; Noel, et. al, 1985).

Table 10. This study examined UMKC students who enrolled as first-time, first-year students during Fall Semester 1989. These students were reexamined after official class rosters were issued on the 20th day of the following four time periods: Fall 1993, Fall 1994, Fall 1995, and Fall 1996. Research studies created a progressive cumulative graduation rate for the SI and Non-SI participants. The primary focus group for this investigation were the College of Arts and Sciences students who represent the average UMKC students in regards to academic preparation upon entry to the University. Some professional school students were excluded from this study due to their high academic preparation level (i.e., medical students) which suggested a separate research study regarding their reenrollment and graduation rates.

Table 10: Graduation Rates of Fall 1989 UMKC First-Time, First-Year Students Cumulative Graduation Rate By End of Four Time Periods

Group Composition	By Fall 1993	By Fall 1994	By Fall 1995	By Fall 1996
SI Participant	15.9%**	31.3%**	38.1%**	46.0%**
Non-SI Participant	12.3%	21.1%	27.4%	30.3%

**Level of significance of difference: 0.01 using chi-square test. Includes all UMKC First-Time, First-Year Freshmen who were not enrolled in professional degree programs. SI was offered in 19 courses during Fall 1983.

Discussion of Table 10. The data suggests that SI makes a positive difference in terms of increased college graduation. The graduation rate was significant at p < .01. Educational researchers have often cited academic success as an important factor to eventual college graduation (Tinto, 1987; Noel, et. al, 1985).

Data from other institutions that have implemented SI.

Study #1: Academic achievement for students from across the U.S. enrolled in classes with SI.

   Nearly one hundred colleges and universities submit data reports annually on their SI programs. The following tables were compiled from 270 institutions of varying types. 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; and they represented a cross section of institutions.

Table 11. This study examined the national data base of information provided by the 270 institutions between 1982 and 1996 by examining the impact of SI with institutions of different types: two-year public, two-year private, four-year public, and four-year private. This data base included 4,945 separate studies of SI with a combined enrollment of 505,738 in those courses. Outcomes measures examined were the mean final course grade, percent A & B final course grade, and percent D, F, and withdrawal course grade. The data suggested use of independent t-test and chi-square.

Table 11
National SI Field Data: FY 1982-83 to 1995-96
N = 270 Institutions; 4,945 Courses; 505,738 Students [Includes SI and Non-SI Participants]

Student Grades		All Institutions N = 4,945	Two Year Public N = 931	Two Year Private N = 20	Four Year Public N = 3,001	Four Year Private N = 993
Final Course Grade	SI	2.42*	2.56*	2.55*	2.36*	2.55*
	Non-SI	2.09	2.09	2.26	2.07	2.31
Percent A & B Final Grades	SI	46.8%**	50.2%**	53.1%**	53.1%**	52.1%**
	Non-SI	35.9%	32.4%	38.9%	38.9%	43.2%

| Percent D, F, & W Final Grades | SI | 23.1%** | 24.3%** | 24.6%** | 24.6%** | 19.1%** |
| | Non-SI | 37.1% | 32.4% | 31.5% | 31.5% | 28.4% |

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

Discussion of Table 11. These findings are similar to those drawn from the UMKC campus: In comparison with their non-SI counterparts, SI-participants received a higher final mean course grade (p<.01), higher percentage of A and B final course grades (<.05), and a lower percentage of D and F final course grades and withdrawals (p<.05). While the largest number of reports submitted for the study came from public four-year colleges, the most common implementers of SI are public two-year colleges, closely followed by public four-year institutions.

Table 12. This study examined the national data base of information provided by the 270 institutions between 1982 and 1996 by examining the impact of SI with institutions of different broad academic areas: business, health science, humanities, mathematics, natural science, and social science. This data base included 4,945 separate studies of SI with a combined enrollment of 505,738 in those courses. Outcome measures examined were the mean final course grade, percent A & B final course grade, and percent D, F, and withdrawal course grade. The data suggested use of independent t-test and chi-square.

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Table 12
National SI Field Data: FY 1982-83 to 1995-96
N=270 Institutions; 4,945 Courses; 505,738 Total Students [Includes SI & Non-SI Participants]
Data Separated by Broad Academic Disciplines

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Types of Courses		Percent A & B (chi-square test)	Percent D, F & W (chi-square test)	Final Course Grade (independent t-test)
All Courses N = 4,945	SI	46.8%	23.1%	2.42
	Non-SI	35.9%	37.1%	2.09
	p-value	0.01	0.01	0.01
Business N = 683	SI	42.4%	25.3%	2.36
	Non-SI	32.9%	38.5%	2.07
	p-value	0.01	0.05	0.01
Health Science N = 50	SI	65.7%	11.8%	2.84
	Non-SI	55.3%	16.6%	2.61
	p-value	0.01	0.01	0.01
Humanities N=268	SI	54.5%	18.1%	2.61
	Non-SI	44.3%	28.1%	2.35
	p-value	0.01	0.01	0.01
Mathematics N = 815	SI	38.7%	36.4%	2.17
	Non-SI	32.2%	48.7%	2.11
	p-value	0.01	0.01	n.s.

Types of Courses		Percent A & B (chi-square test)	Percent D, F & W (chi-square test)	Final Course Grade (independent t-test)
Natural Science N = 1,761	SI	46.4%	22.4%	2.41
	Non-SI	36.6%	34.9%	2.11
	p-value	0.01	0.01	0.01
Social Science N = 1,235	SI	51.1%	18.4%	2.52
	Non-SI	36.7%	34.5%	2.12
	p-value	0.01	0.01	0.01

n.s. = not statistically significant

Discussion of Table 12. These findings are similar to those drawn from the UMKC campus: In comparison with their non-SI counterparts, SI-participants received a higher final mean course grade (p<.01) higher percentage of A and B final course grades (<.05), and a lower percentage of D and F final course grades and withdrawals (p<.05).

Table 13. This study examined the national data base of information provided by the 270 institutions between 1982 and 1996 by examining the impact of SI in specific academic courses or departments. This data base included 4,945 separate studies of SI with a combined enrollment of 505,738 in those courses. Outcome measures examined were the mean final course grade, percent A & B final course grade, and percent D, F, and withdrawal course grade. The data suggested use of independent t-test and chi-square.

Table 13
National SI Field Data: FY 1982-83 to 1995-96
N=270 Institutions; 4,945 Courses; 505,738 Students [Includes SI and Non-SI Participants]
Data Separated by Academic Departments

Types of Courses		Percent A & B (chi-square test)	Percent D, F & W (chi-square test)	Final Course Grade (independent t-test)
All Courses N = 4,945	SI	46.8%	23.1%	2.42
	Non-SI	35.9%	37.1%	2.10
	p-value	0.01	0.01	0.01
Accounting N = 271	SI	45.9%	30.0%	2.49
	Non-SI	35.2%	45.9%	2.17
	p-value	0.05	0.05	0.01
Administration of Justice N = 22	SI	47.3%	21.1%	2.40
	Non-SI	33.6%	31.5%	2.03
	p-value	0.05	0.05	0.01
Algebra N = 219	SI	36.4%	37.5%	2.20*
	Non-SI	27.9%	52.7%**	1.91
	p-value	0.05	0.05	0.01

Types of Courses		Percent A & B (chi-square test)	Percent D, F & W (chi-square test)	Final Course Grade (independent t-test)
Anatomy/Physiology N = 73	SI	52.2%	17.6%	2.60
	Non-SI	39.8%	31.2%	2.30
	p-value	0.05	0.05	0.01
Art N = 12	SI	66.8%	11.1%	2.84
	Non-SI	49.9%	24.4%	2.47
	p-value	0.05	0.05	0.01
Biology N = 528	SI	45.5%	21.8%	2.39
	Non-SI	35.2%	33.5%	2.12
	p-value	0.05	0.05	0.01
Calculus N = 143	SI	43.1%	32.4%	2.26
	Non-SI	37.2%	42.5%	2.06
	p-value	0.05	0.05	0.01
Chemistry N = 718	SI	46.2%	23.2%	2.40
	Non-SI	36.9%	36.5%	2.08
	p-value	0.05	0.05	0.01
Economics N = 357	SI	40.3%	23.7%	2.30
	Non-SI	31.3%	36.1%	2.02
	p-value	0.05	0.05	0.01
Engineering N = 63	SI	37.8%	33.3%	2.16
	Non-SI	30.9%	44.2%	1.91
	p-value	0.05	0.05	0.01
Finite Mathematics N = 30	SI	45.6%	30.4%	2.32
	Non-SI	31.5%	48.4%	1.88
	p-value	0.05	0.05	0.01
Foreign Language N = 46	SI	46.9%	24.7%	2.43
	Non-SI	53.2%	23.8%	2.56
	p-value	n.s.	n.s.	n.s.
Geography N = 93	SI	46.4%	21.1%	2.40
	Non-SI	41.1%	31.4%	2.22
	p-value	0.05	0.05	0.01
Geology N = 44	SI	51.3%	26.3%	2.45
	Non-SI	41.9%	28.8%	2.29
	p-value	0.05	0.05	0.01
History N = 495	SI	52.1%	18.9%	2.54
	Non-SI	34.9%	38.5%	2.06
	p-value	0.05	0.05	0.01
Literature N = 67	SI	47.2%	24.4%	2.46
	Non-SI	32.1%	43.9%	2.08
	p-value	0.05	0.05	0.01

Types of Courses		Percent A & B (chi-square test)	Percent D, F & W (chi-square test)	Final Course Grade (independent t-test)
Marketing N = 9	SI	61.2%	17.7%	2.66
	Non-SI	34.3%	39.5%	1.99
	p-value	0.05	0.05	0.01
Mass Communications N = 15	SI	51.1%	10.9%	2.58
	Non-SI	40.9%	20.7%	2.28
	p-value	0.05	0.05	0.01
Medicine N = 10	SI	82.2%	7.6%	3.25
	Non-SI	64.1%	18.3%	2.79
	p-value	0.05	0.05	0.01
Music N = 22	SI	71.8%	12.5%	3.04
	Non-SI	54.1%	26.5%	2.52
	p-value	0.05	0.05	0.01
Physical Science N = 31	SI	37.9%	29.0%	2.23
	Non-SI	31.5%	42.3%	2.02
	p-value	0.05	0.05	0.01
Physics N = 129	SI	45.1%	24.4%	2.42
	Non-SI	35.9%	36.9%	2.14
	p-value	0.05	0.05	0.01
Political Science N = 154	SI	47.5%	18.1%	2.47
	Non-SI	37.7%	34.5%	2.17
	p-value	0.05	0.05	0.01
Quantitative Analysis N = 10	SI	42.2%	20.0%	2.54
	Non-SI	40.3%	43.1%	2.35
	p-value	n.s.	0.05	0.01
Religion N = 35	SI	59.5%	12.9%	2.68
	Non-SI	45.6%	22.6%	2.42
	p-value	0.05	0.05	0.01
Psychology N = 304	SI	50.2%	18.5%	2.51
	Non-SI	37.2%	32.6%	2.13
	p-value	0.05	0.05	0.01
Sociology N = 139	SI	48.9%	18.6%	2.49
	Non-SI	37.2%	31.5%	2.16
	p-value	0.05	0.05	0.01
Speech Communications N = 17	SI	44.4%	13.7%	2.43
	Non-SI	35.5%	25.2%	2.15
	p-value	0.05	0.05	0.01
Statistics N = 80	SI	48.9%	28.7%	2.40
	Non-SI	41.7%	38.2%	2.26
	p-value	0.05	0.05	0.01

Types of Courses		Percent A & B (chi-square test)	Percent D, F & W (chi-square test)	Final Course Grade (independent t-test)
Zoology N = 33	SI	46.1%	22.3%	2.46
	Non-SI	30.5%	39.9%	2.01
	p-value	0.05	0.05	0.01

n.s. = not statistically significant

Discussion of Table 13. These findings are similar to those drawn from the UMKC campus: In comparison with their non-SI counterparts, SI-participants received a higher final mean course grade (p<.01), higher percentage of A and B final course grades (<.05), and a lower percentage of D and F final course grades and withdrawals (p<.05).

Study #2: Levels of SI participation and academic achievement across ethnicities.

Tables 14 and 15. Data analyses were also used to find the utilization and effectiveness of SI services for students of differing ethnicities. A sample of 13 institutions were 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 UMKC 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 SI-participants in the study, 2,111 were White and 299 were students of color.

Table 14: Participation in SI By Differing Ethnicities: 1987 (N=13 Institutions; 2,410 SI-Participants)

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

Table 15: Effectiveness of SI With Differing Ethnicity and Levels of Previous Academic Achievement: Spring and Fall 1987 (N=13 Institutions, 299 Students of Color)

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

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

Discussion of Tables 14 and 15. Data permit the following observations. Students of color used SI services at equal or higher percent rates than White students (Table 14). Due to low numbers of students of color there were no statistically significant differences between participation rates of

White students as compared with students of other ethnicities. Despite quartile ranking (Table 15), SI-participating students of color earned higher grades than their nonparticipating counterparts (p<.01). SI-participating students of color (Table 15) received a lower percentage of D and F final course grades and withdrawals (p<.05) than their nonparticipating 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.

Study #3: Examining the role of "double exposure" to course content material

One of the rival explanations for the impact of the SI program is that it is merely a "double exposure" to the course content. According to this viewpoint, the student who attends both the lecture and the SI session is exposed to the course content twice: once during the professor's original presentation of the material, and again in the SI session. The student who attends only the lecture has only one such exposure. Thus, in the SI/non-SI group comparisons, the SI group's enhanced performance might be explained through double exposure to content rather than the special environment an SI leader creates within the SI session.

To control for any effects that double exposure to course content might have on student performance, a study that used two first-semester calculus classes for business and economics majors was designed and conducted at the University of Texas at Austin (Kenney, 1989). Each class required that students attend three one-hour lectures per week and two one-hour discussion/recitation sections led by a graduate student. The business calculus course fit the traditional definition of "historically difficult" because more than 30 percent of the students received a grade of D or F, or withdrew from the course. The two classes were taught by the same professor, thus providing a control for any instructor effects. Students enrolled in each class had no statistically significant differences on important independent variables such as gender, placement test score, or high school class rank.

The experimental situation involving SI occurred in the discussion sections, with the graduate student same conducting sessions from one section in a traditional manner, and using SI techniques in the other. That is, in the traditional sections the graduate student performed the typical role of most teaching assistants (e.g., answering questions from homework assignments, clarifying concepts from lecture material, relecturing on the material, conducting test review sessions). In these traditional sections, there was very little active participation on the part of the students. In the SI section, however, the graduate student performed the role of an SI leader (e.g., integrating study skills into the review of important content, having students create practice tests, encouraging reflective thinking through the use of post-exam surveys, sharing of successful learning strategies by the SI leader and the students during review sessions). In the SI sections, students were not only exposed to the course content, but also to components that addressed the learning strategies that form the basis of SI sessions. Thus, issues associated with course content were addressed in both sections, but in different ways between the traditional section and the SI section. To ensure that the activities in the two discussion sections were qualitatively different, observations were conducted throughout the semester. The University of Texas-Austin observers used a rating sheet to ascertain that the activities in the two sections were different so that the student outcomes from

the "traditional" section (control group) and the SI section (treatment group) could be appropriately compared and evaluated.

Results from the study showed that there was a statistically significant difference in final course grades between the control group and the treatment group, with students in the SI sections earning higher average final course grades than those in the control group. This finding is especially notable, given the control that ensured that students in each group received course content assistance, but in different ways. A regression analysis further revealed that in addition to SI participation, factors such as high school class rank, attendance, and prior mathematics achievement and ability levels also affected student performance in the business calculus course. More information on this study can be found in the dissertation research conducted in 1989 by Dr. Patricia Kenney. (Dissertation Abstracts for Social Sciences, <u>50</u>, DA8909688).

D. Summary Discussion of Results
1. Academic Impact of Treatment

Through a variety of data studies in Kansas City and at other institutions from across the U.S. the SI research methodology has accounted for the majority of the students' profile (e.g., previous levels of academic achievement, standardized test scores, high school rank, ethnicity, motivation level) when comparing SI participants and non-SI participants. Data suggests that there is no statistically significant difference between the two groups in terms of what they bring to the classroom and their participation percentage with SI. Final course grades, reenrollment rates and graduation rates are used as the evaluation criteria for effectiveness. With respect to each dependent variable, the differences almost always favored the SI group.

2. Limitations of the SI Model

While success varies among and between SI programs, UMKC is not in possession of data that would suggest that SI has any major limitations. However, SI is more difficult in content areas where prerequisite skills are a key variable. For example, if students do not remember any algebra, they will have a particularly difficult time in chemistry. SI can be and is effective in these areas, however. It just takes more time planning by the SI leader. The clearest evidence UMKC has found is the uneven level of success when SI is attached to a developmental course. Sometimes students refused to attend since the course was not considered demanding or historically difficult by students. After that experience, UMKC has made a point of stressing to adopting institutions that they choose courses that were considered by students and faculty to be historically difficult.

SI has not been effective for students who cannot read, take lecture notes, write, or study at the high school level. Writing includes note taking and expository writing on essay tests. Thus, SI is most effective in non-remedial settings. Currently, UMKC has developed an adaptation of SI, <u>Video-based SI (VSI)</u>, which helps students compensate for severe underpreparation in reading and writing. Students who have found success with VSI include inner-city high school students, rural high school students, community college students, college student athletes, and academic probationary college students.

The SI model needs to be slightly modified in courses that are problem based and involve practice for mastery. In those circumstances, SI sessions need to be more frequent and sometimes longer in length. For example, a three credit-hour accounting course where practicing problems is crucial would need to have SI meet often enough so that every type of problem could be reviewed. A similar example would be a calculus class. SI would have to afford adequate time for

modeling and practice. Frequently, offering SI more times a week and carefully structuring the SI sessions achieves this goal.

3. Additional Areas for Further Research

The research studies conducted thus far have generated additional areas for further analysis. Following are several of the questions that the staff from the National Center for SI encourage current users of SI to pursue.

a. Is there something different about SI participants that helps to explain why they have higher academic outcomes?

This first question examines the characteristics and demographics of students who attend or not to attend SI sessions. Are there statistically significant differences between the SI participating and non-SI participating students? Current studies find that there were no statistically significant differences in participating and non-participating students regarding gender, age, working status, high school rank, standardized test scores, ethnicity, or other factors.

Obviously some student motivation has an impact upon student performance. The issue is whether it provides the majority of the variance regarding outcomes. Some of the research studies at the SI homepage look at this
question. Following are methods that have been employed to examine this issue. UMKC has chosen not to conduct "pure experimental" studies where academic assistance was intentionally and randomly provided to some students and not others. Instead "quasi-experimental" designs have been chosen since the researchers found those designs appropriate and did not deny SI support which they believed had a significant impact upon their persistence in college.

Method #1. One way to deal with the student motivation issue at UMKC was maintaining careful baseline data before the introduction of SI, or any academic intervention, for a particular class. Before SI is offered in a class, the UMKC researchers conduct a study of grade distributions for the class taught by the same professor for several academic terms before SI is provided for the students. This establishes a stable baseline of previous student academic performance earned by students enrolled in the same professor's class. That is essential since different professors often have different criteria and methods for grading students.

When SI is offered for a class, several results occur when comparing student performance in this class to the identical class taught by the same professor in previous academic terms: the rate of course withdrawals drops about in half, the rate of D and F final course grades decrease, the rate of A and B final grades increases, and the rate of C final grades generally increases (probably due to students who used to withdraw or earn D or F final course grades). These differences are statistically significant regarding changes in the grade distribution of the students.

On some rare occasions at UMKC SI service is not continued in a class due to the unavailability of a SI leader for a given academic term. When this occurs, the grade distribution of the students in the class returns to the same profile before SI was introduced to the class. This situation suggests that the absence of the SI variable contributes to the return to the previous grade distribution in the class since other in-class variables have not changed. This return to the original baseline of grade distribution suggests that the SI program did not just attract the students who would have received high grades without the impact of the SI.

Method #2. When UMKC submitted the data concerning SI to the Program Effectiveness Panel of the U.S. Department of Education, they worked with USDOE educational experts to design a protocol to help measure the possible influence of student motivation without resorting to a pure experimental design. A quasi-experimental design was selected as described earlier in this publication. The method endorsed by the USDOE follows: 1. Ask students to state their interest in participating in SI sessions on the first day of class via a Likert scale. This declaration of interest occurs before students know when SI sessions will be scheduled. 2. At the end of the academic term ask students who have not attended SI sessions to state their reason. Two of the possible responses are: m could not due to class conflict and could not due to work conflict. 3. Create three comparison groups: a). Students who participated in SI sessions; b). Students who did not participate in SI due to class or work conflicts but on the beginning of the academic term survey indicated on the Likert scale that they were very interested in attending SI sessions. This becomes the "motivational control" group. c). Students who did not participate in SI due to lack of interest or other similar reasons.

When UMKC periodically conducts this study, the "motivational control group" -- students who were unable to attend SI due to class/work conflicts but were initially very interested -- behave academically more like the students who did not attend SI and did not indicate high interest at the beginning of the academic term. It appears that motivation was not enough.

Earlier in this publication an example of this study was presented. Table 4 contained a comparison across three groups: SI Participants, Non-SI Participants (Motivational Control) and Non-SI Participants (All Others). The "motivational control" group was composed of students who at the beginning of the academic term expressed high interest in attending SI but were unable to participate due to a time conflict (e.g., another class at same time, work commitment). The data suggests that the motivational control group received academic grades similar to the other Non-SI (All Others) group rather than grades associated with the SI-participants. The research suggests that motivation was not the primary variable in accounting for higher academic performance.

Method #3. A related issue to student motivation is whether perhaps it is "double exposure" to the content material that is most significant variable. Earlier in this publication was a summary of work by Dr. Patricia Kenney on this issue. She compared student performance of students enrolled in the same class but divided into two mandatory attendance groups. One group had their sessions conducted in a traditional discussion group style while the other group was conducted according to SI protocols. The results favored the SI group.

Additional Studies. The SI annotated bibliography also cites other studies that have studied this issue. It is available through the SI homepage http://www.umkc.edu/cad/si/   Additional areas for research include several in the affective domain (e.g., locus of control, self-efficacy, self-esteem). Work by Visor, et. al. (1992) provides stimulus considering the impact of these variables as independent and dependent variables.

b. Is it possible that the academic discipline or the course professor is a significant factor in explaining the differences between SI and Non-SI participants?

SI has been offered in a very heterogeneous environment: 5,000+ SI courses; a variety of types of post-secondary institutions (two year/four year, public/private, large/small); institutions located throughout the United States; a variety of academic disciplines; a variety of courses within academic disciplines; many classroom professors; SI at the undergraduate, graduate and professional school level; many SI leaders; and many SI supervisors. The replication of the findings is generally the same. The statistically significant results are: higher grades, lower percentage of course withdrawals and higher reenrollment rates for SI-participants when compared with Non-SI participants (please see Tables #11, #12 and #13).

Additional areas for research in this area include: conduct studies that examine SI in a single class (using more sophisticated research procedures that can take into consideration more variables); conduct studies that examine SI in the same class taught at several institutions; examine SI in different classes taught by the same professor; and study whether SI participant academic achievement is correlated with the number of academic terms that the SI leader has served in that position.

c. Is the impact of SI due to a double exposure to the content material (once by the professor and once by the SI leader) and not through the SI session strategies facilitated by the SI leader?

Research from the University of Texas examined this question. The data suggested that SI session activities were unique in their statistically significant impact upon raising student academic performance in comparison with students enrolled in classes that provided only traditional discussion sessions that reviewed the material a second time. This study was previously discussed in this paper. Additional studies at other institutions could replicate this research and extend it to other academic disciplines.

d. What could be learned concerning the impact of the SI program for SI participants, faculty members, or others through use of qualitative research procedures?

Based on interviews with SI participants, SI leaders, and campus educational leaders, the following are some of the benefits attributable to SI: SI promotes the development of leadership and communication skills (Dr. William Eddy, Dean of the Bloch School of Business, University of Missouri-Kansas City). SI experience enables graduate students to be more competitive for top scholarships or positions (Dr. Joan Dean, Co-Director of the UMKC Academic Honors Program). SI experience has been responsible for attracting SI leaders into the field of education (Sally Richardson, Kingston Polytechnic College, England). SI has facilitated faculty cooperation and professional development with the faculty and staff (Jeanne Carter, Oakland University, Rochester, MI and Jean Jubelirer, Milwaukee Area Technical College, Milwaukee, WI).

Careful use of qualitative research methods could help to identify more clearly the impact of the SI program with SI participants, SI leaders, and faculty members that have SI attached to their course. Research data would provide useful feedback for the improvement of the program on local campuses.

e. Are there long term positive effects of the SI program?

Data from UMKC suggests that SI contributes significantly to higher reenrollment and graduation rates (Tables # 8, #9, and #10). Other UMKC studies suggest that after the introduction of SI for a course, the rate of D, F final course grades and withdrawals was consistently and significantly lowered as long as the SI program was provided for the course. If SI was withdrawn from the course, the levels of D, F and Withdrawals increased to similar levels before the introduction of SI to the course. A third way to examine the long term impact of SI is to see if there was a transfer effect to other individual courses that SI participants enroll. A research study at UMKC examined a group of pharmacy majors who were enrolled in a sequence of two biology courses over succeeding academic terms. The first biology course had SI offered in connection with it. No SI was offered with the second biology course in the sequence the following academic term. There were no statistically significant differences between the two groups of pharmacy majors (e.g., standardized test scores, high school rank, cumulative GPA) except that the SI participants earned higher final course grades than the non-SI participants in the first biology class. In the second biology class the former SI participants earned higher mean final course grades than the non-SI participants. The research suggests that the SI participants used learning strategies from the first course and applied them to the second course. Qualitative research studies conducted at UMKC and other institutions suggest that students transfer the learning strategies learned through the SI sessions to other courses in the same and succeeding academic terms.

E. Educational Significance of Results
1. Relationship of Results to Personal and Societal Needs

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). Data from UMKC suggests that SI contributes significantly to higher reenrollment and graduation rates (please see Tables # 8, #9, and #10).

A college degree is an important economic and social resource for the graduating students. Pascarella and Terenzini's book, How College Affects Students (1991), reviewed and analyzed almost 3,000 studies concerning the impact of college on students. College graduates earned between 18.3 and 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 support with welfare and unemployment benefits. Pascarella and Terezini's research study does not suggest that everyone should try to be a college graduate, but the 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

<u>wants</u> to complete a degree, <u>should</u> 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.

2. Comparison of Results to Results from Other Programs

   Educational leaders are faced with the need to make careful selection of academic interventions from among a field of possible choices. Part of the criticism of the developmental education and learning assistance field is that it is difficult to find programs that have regular programs of rigorous evaluation. The most prevalent program on most college campuses are individual tutoring programs. In a review of the professional literature concerning tutoring, Maxwell (1990) made the following observations: some studies find that high ability or more experienced students benefit most from tutoring (p. 2); it is rare for studies to show that tutored students improved their grades (p. 2); and that there is no evidence that tutoring helps the weakest students (p. 4).

   Since SI is one academic treatment that is academically beneficial and attracts students in nearly equal percentages from different ethnicities and previous academic achievement levels, the institution may be able to reduce expenses since they do not have to maintain duplicate programs for each student subpopulation. It appears that no other student academic support program has the wide appeal with a research-based strategy for learning and success.

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