Impact of the Supplemental Instruction Experience on Science SI Leaders

By Nancy M. Lockie and Robert J. Van Lanen

ABSTRACT: ***This qualitative study describes the experiences of SI leaders in science courses. Analysis of data using Colaizzi's phenomenological approach has indicated the following advantages of the SI experience for SI leaders: (a) greater appreciation of the diversity of student learning styles, (b) increased understanding of the subject matter, (c) greater self-confidence as a learner, (d) development of closer relationships with faculty, (e) application of the strategies and skills learned as an SI leader in other courses, and (f) realization of the importance and value of collaborative learning. The results of this study can be used by Learning Center professionals and faculty to successfully recruit new SI leaders and to customize the SI model to maximize its effectiveness.***

Collaborative learning makes a strong contribution toward students becoming active learners.

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The high failure rate of students in lower division science courses is well known. Many capable students are driven from science by the inability to tolerate traditional learning approaches (Webster & Hooper, 1998). In *Achieving Educational Excellence* (1985), Alexander Astin argues that improving the teaching/learning process among college students relates to one central issue: student involvement.

Pascarella and Terenzini (1991) focused on how college affects students and reported that academic achievement is highest for students who experience favorable interactions with faculty and staff in the college setting. Tinto (1989), identified four significant factors in the dropout of students: Many students felt socially isolated on campus, had difficulty in adjusting to the new environment, were not able to link the knowledge received in the class lectures to what they already understood, and had difficulty in the college environment. In an effort to empower students to successfully persist in science, a Supplemental Instruction (SI) program was implemented in a variety of freshman- and sophomore-level science courses at Saint Xavier University beginning in Fall 1989.

The Saint Xavier SI program is a collaborative enterprise that draws students into interactive relationships with peers and faculty using small groups to facilitate learning. Collaborative learning makes a strong contribution toward students becoming active learners rather than passive recipients of information (Tinto, 1998). Cooperative learning is "a subset of collaborative learning" according to Arendale (2004, p. 28). He has identified SI as one of six postsecondary peer cooperative learning programs that "intentionally embeds learning strategy practice along with the review of academic content material" (p. 27). The other five programs are Accelerated Learning Groups (ALGs), Emerging Scholars Program (ESP), Peer-Led Team Learning (PLTL), Structured Learning Assistance (SLA), and Video-Based Supplemental Instruction (VSI).

Overview of Supplemental Instruction

Supplemental Instruction, developed by Deanna Martin at the University of Missouri-Kansas City (UMKC) in the 1970s, is a nonremedial academic support program which targets high-risk courses defined as courses with a 30% or greater rate of D, F, or W grades (Blanc, DeBuhr, & Martin, 1983; Martin & Arendale, 1992; Ogden, Thompson, Russell, & Simons, 2003). In 1981, the United States Department of Education recognized the validity of the UMKC SI Program by designating it to be an Exemplary Educational Program. Key collaborators in the SI model are the SI leader, the SI supervisor, and the course instructor. Offered to all students in courses with high failure rates, SI provides assistance on an outreach basis in regularly scheduled out-of-class study sessions that begin the 1st week of class. The study sessions are led by the SI leader, a student who has successfully completed the "high-risk" course. The SI study sessions provide a forum for students to discuss and process course content. A key philosophical component of SI, therefore, is that terms such as "high risk" are assigned to the course rather than to the students. In the SI sessions at Saint Xavier the SI leader facilitates the development of problem-solving skills, appropriate learning strategies, and active involvement of students in the language and content of science courses. On the basis of a national study of SI programs at 735 U.S. postsecondary institutions, Arendale

(2001) has indicated that maintaining fidelity to the following program activity components of the UMKC SI model positively correlated with student outcomes and satisfaction with the SI program: SI supervisor involvement, SI leader involvement and SI leader training. Further information about the SI model is discussed by Arendale (1994) and Burmeister (1996).

Impact of Supplemental Instruction on Enrolled Students

Previous studies have established that SI is an effective strategy for improving student performance as measured by final course grades in arts and sciences courses (Blanc, DeBuhr, & Martin, 1983; Doty, 2003; Arendale, 1997; Martin & Arendale, 1994), a biology course (Moore & LeDee, 2006; Shaya, Petty & Petty, 1993), chemistry courses (Lundeberg, 1990; Van Lanen & Lockie, 1997; Van Lanen, Lockie & McGannon, 2000; Webster & Hooper, 1998), a history course (Wolfe, 1987), mathematics courses (Burmeister, Carter, Hockenberger, Kenney, McLadren, & Nice, 1994; Kenney & Kallison, 1994; Lazari & Simons, 2003), and physical science and social science courses (Kochenour, Jolley, Kaup, Patrick, Roach, & Wenzler, 1997). The findings from the majority of these studies reveal that the percent of D, F, or W grades for students attending SI sessions is lower than for students not attending, and mean final course grades are higher for students attending SI sessions than for students not attending. However, McCarthy, Smuts, and Cosser (1997) argue that methods of assessing effectiveness of university SI programs have been inadequate and suggest broadening research methods to include qualitative forms of assessment. Congos (2003) has further described factors that should be considered in reviewing the effectiveness of SI programs.

Impact of Supplemental Instruction on SI leaders

A major difference between SI and other forms of collaborative learning is the role of the SI leader. Rather than forming peer study groups and studying on their own, the SI leader is present to keep the group focused on studying course content and to model appropriate learning strategies that the other students can adopt and use in the present course and in future course work (Dimon, 1988; Johnson, Johnson, & Smith, 1991). Although numerous studies have focused on the SI model and the impact of SI participation on the performance of students in an SI-related course, there have been few investigative studies regarding the value of the SI experience from the perspective of the SI leader.

Webster and Hooper (1998) noted that SI leaders "continued to develop their communication, teaching and leadership skills through the extensive training portion of the program" (p. 331). Also Zaritsky and Toce (2006) measured the effects of the SI program for SI leaders by surveying 184 former SI leaders (with a response rate of 22%). Identified benefits to SI leaders were: a better understanding of course material (95%), discovering the joy of helping others and improving their skill as educators (73%), and gaining self-confidence and strengthening their leadership and communication skills (98%). Consistent with these results, Stout and McDaniel (2006) reported findings based on their observations and experiences in student services. Benefits attained by SI leaders as a result of their participation included: (a) increased understanding of course material, (b) improved communication and relationship-building skills, (c) enhanced personal development, and (d) enhanced professional development.

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Methodology

Phenomenology is both a philosophical movement and a research method that was used to explore and understand the lived experiences of SI leaders in science courses. A phenomenological approach was chosen to enable the researchers to acquire the meaning and understanding of the SI experience from the perspective of the SI leaders who are living the experience, rather than from the researchers' perspective. A lived experience refers to how a person immediately experiences the world as the phenomenon is occurring (Husserl, 1970). Schools of Phenomenology have developed different approaches to data analysis. Three frequently used methods of data analysis for descriptive phenomenology are the methods of Colaizzi (1978), Giorgi (1978), and Van Kaam (1966). Colaizzi's method is applied in this study because it allows the researchers to use a structured approach to data analysis and to expand their understanding of the meaning within the SI leaders' responses. In addition, Colaizzi's procedural analysis is a well established and proven method that has been used extensively in qualitative research literature. Colaizzi's approach involves the following stages: (a) reading the subject's descriptions of the phenomenon, (b) extracting significant phrases pertaining to the phenomenon from the subject's description, (c) formulating the meanings of each significant statement, (d) organizing the formulated meanings into cluster of themes, and (e) developing an exhaustive description of the phenomenon by integrating the results of the data analysis. However, Colaizzi (1978) does suggest that the framework is not definitive and that there is a tendency for the stages to overlap.

Sample

All SI leaders (N = 44) over a 9-semester period were invited to participate in this study. The SI leaders had recently passed the course for which they were to be an SI leader with a B or better grade and were recommended by science faculty. Of this original group 29 (66%) SI leaders chose to participate in the study. Their written descriptions were coded and demographic data was not obtained.

The SI leaders were students in the undergraduate program at the university, either science or nursing majors, and trained in the SI model using the UMKC (University of Missouri-Kansas City, 1994, 1997) SI training manuals. During the semester, SI leaders and supervisors met regularly. The researchers had also been trained as SI supervisors at the UMKC campus over a 3-day period prior to implementing Supplemental Instruction on our campus.

At the time of this study, SI was offered in six science courses at our institution. Principles of Inorganic Chemistry (Chemistry 107), Principles of Organic and Biochemistry (Chemistry 108), and Human Anatomy (Biology 202) were required courses for nursing majors. General Chemistry I and II (Chemistry 111-112), Organic Chemistry I and II (Chemistry 251-252), and General Physics I and II (Physics 201-202) were required of biology and/or chemistry majors.

Colaizzi (1978) asserts that research subjects in a phenomenological study must meet the criterion of having experience with the investigated topic together with being articulate in communicating about the experience. The SI leaders in this study meet this criterion because of their training, their understanding of the SI model, and their experience in implementing it.

Procedure

At the completion of each semester, the SI leaders were informed about the purpose of the research study and were invited to participate. Those who chose to be involved in the study met privately with the researchers. Each was asked to respond in writing to the following open-ended questions designed to elicit feelings and descriptions of their lived experiences as SI leaders:

1. Did the SI experience enrich you as a student? If it did, how did it enrich you? What are your thoughts?
2. Have you done anything new or different as a result of your experience as an SI leader? If you have, please provide examples of new behaviors.

The SI leaders were asked to carefully reflect on their experiences in the SI study sessions in their written responses to the study questions. These responses were to be completed at their leisure and returned to either one of the researchers within a 2 week time frame.

Data Analysis

SI leaders' written responses were analyzed using Colaizzi's (1978) data analysis methodology. In order to establish a clear decision trail and ensure audibility, the authors used the following process. Sheets of paper (11″ x 17″) were used to create four columns on two separate pages. On each page the first column was labeled Research Questions; the second column was labeled Significant Statements (that emerged from the research question), the third column was labeled Formulated Meanings (from the significant statements), and the fourth column was labeled Themes.

The goal of the phenomenological method requires the researcher to study the phenomenon without any preconceived notions or expectations. This suspension of the researcher's beliefs has been termed bracketing by Husserl (1960). Prior to reading the SI leaders' written responses, the researchers attempted to bracket their experiential knowledge in order to accurately portray the reality described by the SI leaders who participated in the study. Colaizzi's (1978) procedural steps were followed:

1. The SI leaders' descriptions of the phenomenon were individually read and explored several times by the authors in order to acquire a feeling for their responses.

2. From this analysis, all significant phrases or statements describing the SI phenomenon were extracted from the written descriptions of the SI leaders for each question and placed in the second column adjacent to the selected research question. To be considered a significant thought or statement, the statement had to describe some aspect of the SI experience from the viewpoint of the SI leader. Each of the authors reviewed the initial set of significant statements and compared them to the SI leaders' original written descriptions. According to Colaizzi (1978), when the same or nearly the same statements are found, repetitious statements should be eliminated. This suggestion was followed; when disagreements between the authors arose regarding the validity of a particular significant statement (e.g., was it a duplication of another significant statement?), the authors resolved the difference by going back to the raw data from the SI leaders' original written responses. By following this process, agreement was reached on a final list of 26 significant statements that adequately and completely described the reported experiences of the SI leaders.

3. The next step of Colaizzi's (1978) model—known as formulated meanings—required the researchers to take a precarious leap from what participants said to what they meant in the list of significant statements. The authors reviewed the significant SI leader statements attached to the selected research question and, in column three, developed a formulated meaning for each significant statement. Initial disagreements about the list of formulated meanings were resolved by comparing them to the original written responses and the significant statements compiled. This "precarious leap," moving beyond the written responses, should never sever the meaning totally from the responses (Colaizzi).

One value of the SI experience cited by leaders was the promotion of an active, collaborative problem-solving approach to learning.

4. In this step, the formulated meanings were organized into themes. Key theme words were identified for each formulated meaning which, whenever possible, were words from the written responses of the SI leaders. The results at each step of the process were compared with the SI leaders' original descriptions to ensure reliability. Finally the themes were organized into clusters. The final description of the SI leaders' experience contained in the four theme clusters which emerged from the analysis was validated by comparison with the SI leaders' written responses to open-ended questions (see Table 1, page 6).

Reliability and Validity

Reliability and validity were addressed throughout the study according to guidelines proposed by Guba and Lincoln (1985) and Sandelowski (1986). Qualitative research in this study was viewed in terms of consistency and auditability (Polit & Beck, 2006). Auditability was ensured by clearly delineating a decision trail used in arriving at conclusions. Unfortunately, it was not possible for SI leaders to review the final analyses of their written responses since the study participants had graduated or were not available by the time data analysis had been completed. Therefore, to ensure validity, two researchers (authors) independently reviewed the analyses at each stage by comparing the results with the SI leader written responses. Consistency was ensured by including all SI leaders from the 9 semesters who chose to participate. Dependability and conformability was achieved by keeping notes about raw data and the written process undertaken by the authors. The researchers sought to ensure truth and credibility of the data by consistently validating their understanding of the SI leaders' written responses to the open-ended questions (Guba & Lincoln, 1985).

Results

Analysis of the verbatim responses of the SI leaders revealed four central themes, describing the SI leader experience from the perspective of the SI leaders (see Table 1).

Theme 1: The Diversity of Student Learning Needs

In Theme 1, SI leaders describe an appreciation of the individuality of the students' learning needs and the diverse ways in which students learn as well as the commonality of certain learning experiences. As one SI leader has noted:

> I gained some insight into the unique perspective each student brings to an educational challenge, while at the same time observing how similar certain emotions and experiences are for most of us. I was enriched by seeing how different people of different abilities approach a challenge and succeed.

Another leader shared that she found the students in her study sessions to possess an "ability to look at material from different perspectives." An SI leader reported that the experience "helped me to see different levels of academic abilities and seeing their different learning styles. What has been efficient for some and less effective for others?" One value of the SI experience cited by leaders was the promotion of an active, collaborative problem-solving approach to learning.

> I think the constant urge for them to assume the responsibility for their own learning challenged them to attempt to master the subject to their fullest capacity-instead of waiting for the answers to be given to them. I think this sort of program encourages students to learn the concepts not just memorize them.

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Table 1
Clusters of Themes Expressing the Meaning of the SI Experience

Themes	Sub-Themes
Theme 1: Diversity of student learning needs	• In the SI study sessions the SI leaders developed an appreciation of the diverse ways in which students learn. • SI leaders found that students learn differently and tried varied approaches to learning new content. • SI leaders realized that students have varied levels of anxiety and ways of dealing with stress.
Theme 2: Enriching academic experiences	• Increased understanding of science content made it easier for SI leaders to communicate that knowledge to others. • Increased awareness about their own learning needs made SI leaders better students. • Learning different ways to explain a concept led to better understanding of the material. • Learning became a two-way street in SI study sessions. • SI leaders recognized the importance of establishing good study habits and the role of study groups in learning
Theme 3: Enriching intrapersonal experiences	• When students were able to grasp the "big picture," the SI leader felt a sense of satisfaction. • Strengthening of leadership and communication skills were noted by SI leaders. • Increase in self-confidence translated into becoming more active participants in other classes. • SI leaders developed a greater level of responsibility because of their leadership in study sessions. • The awareness that there is a similarity of emotions and experiences between SI leaders and students . • SI leaders felt more sure of themselves and were able to answer questions and explain content better.
Theme 4: Relationship with faculty	• The SI leaders got to know the course instructor and the SI supervisor as people and developed a respect for them as teachers. • SI leaders developed an understanding of the difficult task it is to help students learn from the teacher's perspective.

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As a result of their SI experiences, SI leaders learned that that academic challenges can result in varied levels of anxiety for students and that students have different ways of dealing with such anxiety. One SI leader noted that "learning new material produces frustration and anxiety for new learners." Another leader stated that being an SI leader led to the realization that "anxiety does get in the way of learning." Confirming these observations, a leader wrote the following regarding the SI experience:

> It helped me to realize different levels of anxiety experienced by students and their differing ways of dealing with high stress levels. It enabled me to learn to direct high stress levels into effective study habits. Anxiety seemed to mostly get in the way of learning. So I learned some ways of reducing anxiety levels by speaking with other people who were going through the same thing as I was….It helped me to realize the benefit of study groups.

Theme 2: Enriching Academic Experiences

In Theme 2, SI leaders described enriching academic experiences in terms of various increases. Understanding of science content, ability to communicate science knowledge to others, awareness about their own learning needs, learning different ways to explain a concept, and recognizing the importance of establishing good study habits and the role of study groups in learning were all enhanced.

> Acting as a facilitator for my peers did increase my knowledge of the subject. In attempting to show others how to set up problems and work them out in an organized manner, I was able to review and gain a deeper understanding of the material. It is one thing to know how to work out a problem, but it is completely different being able to communicate that knowledge to another person.

Another leader cited the value of using different approaches in increasing understanding of the material:

> I realize that if you can't explain something to others (or yourself) verbally or by demonstration, you don't really know it. By asking questions other than those I might think of, or even asking the same question in a different way, it opened up my mind to new ways of approaching the material. Reinforcing concepts for others only helped me to reinforce them for myself.

Many SI leaders increased their own awareness of their learning needs due to their SI experiences, which made them better students. One leader cited "the importance of studying hard and working each day." Another leader indicated the following:

> I read everything thoroughly so that I understand the content, what is asked, and what the key points are. I actively participate; this helps to reinforce the readings and the lecture. I read before lecture so that the material isn't totally foreign.

Other leaders now valued time management, organizational skills, problem-solving skills, and the use of study groups in other classes and independent learning:

> This experience has reinforced my own practice of learning things for me. That is, not to rely on someone else to supply me with the information I need but to rather search for it myself and refuse to stop until I am satisfied.

Leaders found that success in SI sessions was greatest when different approaches were used to explain concepts with which students were having difficulty.

> I pay more attention than I did when I took the course and try to find ways of presenting the material differently; students learn differently and sometimes several approaches need to be tried before one works.

Leaders claimed the constant exchange between the SI leader and students in the SI sessions provided opportunities for learning for both groups. A representative description follows:

> One of my goals for the [sessions] was to make sure the students knew how to find answers to their questions. I wanted to assist them but not be their primary resource. We

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> worked on problems on paper and greaseboard, taking turns being teacher, and students were given the opportunity to ask questions to other students. Before quizzes and exams students would share ways of learning and remembering the material. Sometimes I would ask students to write down some questions they had and bring it to the session, and we would pool resources and together the students would try to come up with the correct answers.

The SI leader experience helped SI leaders recognize the importance of good study habits and develop an appreciation for the impact that study groups can make in maximizing learning. One leader gave the following examples of new behaviors resulting from the SI experience: "I study in groups rather than individually, I am more responsible, and I participate more in class." Another leader cited the following:

> Active participation in the learning process helps to reinforce the material. I find myself doing more practice problems in my math classes and in Physics. I also work my Physics problems in a group with my friends (it's kind of like an informal SI session). I spend more time studying because I understand its importance.

Theme 3: Enriching Intrapersonal Experiences

In Theme 3, the SI leaders cited an enrichment of intrapersonal experiences subsequent to their participation. These experiences produced a sense of satisfaction, strengthened leadership and communication skills, increased self-confidence, stimulated a greater level of responsibility, augmented awareness of the similarity of emotions and experiences, and increased self-assurance in answering content questions. A few leaders shared feelings of satisfaction: "This experience gave me a sense of accomplishment when the students began to understand the concepts and felt comfortable with them; it made me feel as though I was helping them." Another leader claimed "satisfaction of seeing a student's reaction when they finally understand a concept."

Many leaders noted improvement in their leadership skills and their communication skills as a result of the SI leadership experience.

> This experience helped enrich me as a student in many ways. First of all, I have learned to develop my leadership skills. I have also learned to work in a group to accomplish a goal. By trying to allow those people who attended SI to get the most out of the sessions, I have increased my time management skills.
>
> This experience enriched me greatly by allowing me to enhance my communication skills. The interactions with students provided vital opportunities for both teaching and evaluating which have proven beneficial in my role as a nurse. Some of the teaching techniques used can also be used to teach patients new information. The experience also allowed me to meet other nursing students and friends I perhaps would have never known.
>
> I think this experience increases or strengthens the facilitator's interpersonal skills. When students come to the sessions and are unacquainted with the school or other students, I would try to make them feel comfortable by starting out the session by talking with the student and encouraging conversation between all the students. If a friendly and familiar environment is established the student will not be intimidated or afraid to voice their concerns or questions. The effect [sic] they can better interact in the session.

"If a friendly and familiar environment is established the student will not be intimidated or afraid to voice their concerns or questions."

The increased confidence resulting from the SI experience translated into new behaviors in other courses the leaders were taking. "Increase in self-confidence translated into becoming more active participant in other classes. I felt more like a leader. I feel surer of myself when I study for my other classes."

> SI has taught me how very important it is to study hard and to practice problems every day. It has also taught me a great deal about responsibility. Finally, I have learned that if you don't understand something, it is always better to get help right away.

SI leaders developed a greater level of responsibility for learning because of their leadership in study sessions. Many of the leaders commented on how successful they were in getting students to take responsibility for their own learning, thereby demonstrating their strong personal sense of responsibility.

> It was rather difficult at the beginning, we had to adjust to a new environment and format and students were trying to become acclimated to the class and material. One of my goals for the course was to make sure the student knows how to find answers to their questions; I wanted to assist them but not be their primary resource. We worked out problems on paper and grease board taking turns being teacher.
>
> In some cases, I would have to say "no." Still by my example as a role model that had successfully completed the course backed up by strong performances of those in the sessions who readily accepted responsibility for their results (good and bad) sends a strong message. To those who saw or came to see SI as an aid or method of best dealing with the work necessary to pass the course I was successful; with those who wanted an easy way out I was not.

As a result of the SI experience, SI leaders realized that students in the SI sessions had some of the same anxieties and experiences they did when taking difficult courses. Leaders also came to appreciate that learning new material produces frustration and anxiety for new learners.

> Many of the students expressed major anxieties; they felt that the course was designed to flunk them out or that it was so difficult that they could never pass it. Pointing out topics that are major and that the students needed to know helped to relieve some of their anxieties.
>
> Chemistry 108 is anticipated with some degree of "dread and panic" by most students and yet quite a few students feel they are alone in assuming that they won't be able to do it and have rationalized why it's harder for them than for others (i.e., family duties, work, etc.). As a result, I can understand more easily that it is natural to experience some anxiety and self-doubt and therefore it is not a negative thing any longer.

Theme 4: Relationship with Faculty

In Theme 4, SI leaders reported improved faculty/student relationships as a result of the SI experience. Leaders indicated that they got to know both the course instructor and the SI supervisor as people and developed a respect for them as teachers. They also developed an understanding of how difficult a task it is to help students learn from the teacher's perspective. Leaders made the following statements regarding developing relationships with faculty. "Knowing the faculty as people and respecting them"; "I was able to serve as a barometer of mood, understanding of the

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material and specific strengths and weaknesses and convey this to the faculty member in general terms"; "Understanding the difficult task it is to help students learn"; "Teaching takes a lot of work and I applaud the efforts of teachers everywhere."

> I believe now that if I had a problem in my own studies that I could talk to the teacher. If I have learned anything about SI, I have learned that teachers are approachable and they are willing to help and listen to you.

Discussion

In this qualitative study, the investigators sought to examine the SI leaders' perspective as facilitators of the SI study sessions. The findings revealed an interplay of four themes: (a) diversity of student learning needs, (b) enriching academic experiences, (c) enriching intrapersonal experiences, and (d) relationship with faculty.

The findings are especially important in delineating the many significant advantages of the SI experience for SI leaders and for the institution as a whole. For example, advantages revealed through the themes can be viewed as providing increased student learning opportunities not only for the SI leader but also for students in the "high-risk" courses. This challenges the institution to increase its focus on improving student learning opportunities, thereby potentially increasing student retention. In addition the findings provide a number of implications for learning center professionals and developmental education programs.

Advantages of the SI Experience for Supplemental Instruction Leaders

Examination of the themes resulting from the study and the supporting student comments validates the richness of the SI experience for the SI leader on a variety of levels. As a result of their experience SI leaders cited a greater understanding of and appreciation for the diversity of student approaches to learning (Theme 1) as well as a better grasp of how different students deal with anxiety related to academic performance. Through collaboration, SI can enhance thinking as individuals learn to solve problems together with their capable peers initially and then move to independent problem solving (Lundeberg & Mooch, 1995). In the SI model, students are asked to work together in groups so that the work of the group can only be accomplished by each and every member of the group doing her or his part. The model thereby gives students themselves the greatest responsibility for their own learning (Muhr & Martin, 2006).

Supplemental Instruction leaders' increased understanding and mastery of subject content and improved problem-solving and study skills (Theme 2) has impacted recruitment. We have found this advantage of the SI experience to be a strong selling point for students seeking admission to professional schools (e.g., dentistry, medical school, nursing, pharmacy, etc.). These students perceive the SI leader experience to be a means of enhancing and solidifying their scientific knowledge in preparation for professional school exams (MCAT, DAT, and PCAT).

SI leaders in this study indicated improved leadership and communication skills and self-confidence as a result of their SI experience (Themes 2 and 3) which translated into more active participation in other courses they were taking. SI leaders also noted a great deal of personal satisfaction when students in SI sessions were able to grasp the concepts and understand the material. Stout and McDaniel (2006) similarly noted that "SI leaders can expect to improve their communication skills and build mature professional and personal relationships" (p.57) as a result of the SI experience.

SI leaders…benefit because their own learning improves when they structure learning experiences for the students they are guiding.

The positive impact of getting to know faculty on a collegial basis as a result of the collaborative process of the SI model (Theme 4) is understandable given the fact that faculty are an integral part of the SI program. Consistent with these results, Davis (1999) noted that one benefit for the SI leader was improved "feelings of connection to the campus." These observations are consistent with the work of Pascarella and Terenzini (1991) who underscore the influence of faculty involvement on both student retention and satisfaction in college courses. The SI leaders expressed that the SI experience had a significant impact on their approach to learning and their success in other courses they were taking (Themes 1, 2, and 3). Study strategies and skills learned as SI leaders were applied in their studies in other courses. The SI leaders—who are students themselves—also benefit because their own learning improves when they structure learning experiences for the students they are guiding. SI leaders further develop leadership skills, learn how to influence group dynamics, and learn strategies for motivating others to excel.

Supplemental Instruction leaders realized the importance and value of collaboration and of the collaborative process used in the SI sessions and applied it to their studies in other courses (Themes 1 and 2). The SI leader lived experience has validated that SI is a positive and enriching experience for both students and SI leaders and makes a strong contribution toward students becoming active learners rather than passive recipients. SI "enhances thinking, because individuals can learn to solve problems independently by first solving problems together with competent peers" (Lundeberg & Mooch, 1995, p.313).

Implications for Practice

The role of the SI leader is pivotal in creating an environment that enhances learning for both the students and the SI leader (Theme 1). Therefore, SI training sessions should devote some time to a discussion of the variety of student learning styles and strategies to maximize learning for each SI group so that SI leaders are properly equipped to address the diverse student population they are likely to encounter. Details of strategies successfully used in science SI sessions at Saint Xavier have been reported by the authors. (Lockie & Van Lanen, 1994). Faculty planning training for new SI leaders might consider engaging trainees and previous leaders in role play, allowing experienced leaders to reflect varied learning styles of students they have encountered.

Active collaboration among the course instructor, SI leader, SI supervisor, and students (Themes 3 and 4) is essential for success of the SI experience in science courses. SI encourages favorable faculty-student relationships through collaborative learning strategies, which includes the training and coordination of the SI leaders with the learning center professional staff. The growing popularity of learning communities reflects the now widespread recognition of the importance of institutional involvement to student education (Tinto, 1998). The positive effect of peer interactions on student learning further validates the use of SI (Terenzini, Pascarella, & Blimling, 1996).

The hallmark of science SI sessions at Saint Xavier University is an emphasis on problem solving. The active involvement of the SI leader and all students attending the SI session supports this emphasis. Programs such as SI require that students try to succeed and learn more than course content while learning how to learn. Researchers agree that the longer students remain in school, the greater their chances for persisting to graduation (Astin, 1987, 1993; Boyer, 1987; Pascarella & Terenzini, 1991; Tinto, 1989, 1993).

According to McGuire (2006) most students enter college without knowing how to learn or how to study and therefore have difficulty succeeding in courses that require critical thinking. Supplemental Instruction provides the perfect environment in which to introduce students to academic interactions and intellectual/institutional involvement that may be particularly important for the success of nontraditional students who might be unfamiliar with the culture of academe.

The lived experiences of SI leaders in this study (Theme 4) argue strongly for the involvement of faculty in all aspects of SI and other learning assistance programs, which increases connectedness to the academic experience. In our case, SI supervisors are often faculty members whose discipline matches that of the majority of the students in the course; they provide an important mentoring role for both students in the courses and for SI leaders. Learning Center professionals and course faculty collaborate in the selection and training of SI leaders. Meetings are held biweekly during the semester and involve the course instructor, SI leader, and SI supervisor. Thus, there are many opportunities for SI leaders to get to know faculty on an individual basis (Lockie & Van Lanen, 1994). Similar selection and training processes could be implemented for tutors and other learning assistance staff.

One of the most important findings of the study was the consistent observation by SI leaders that the SI experience had a major impact on their approach to learning in other courses. This finding reveals SI's significant impact beyond SI-related courses. Learning Center personnel are well advised to stress this impact as part of the cost/benefit analysis of SI programs. Successful implementation of the SI program at Saint Xavier requires the cooperation of key personnel across campus: administrators, Learning Center professionals, faculty, and students. SI requires the culture of the university to embrace student learning, thereby publicly supporting and publicizing the SI program (Hurley, Jacobs, & Gilbert, 2006).

Recruitment of a sufficient number of qualified and interested SI leaders for SI related science courses is a challenge at a small liberal arts university like Saint Xavier. This study validates the richness of the SI experience for the SI leader on a variety of levels. We have successfully used the results of this study in recruiting new SI leaders. It is important that developmental educators communicate to both prospective and current SI leaders and to institutional administrators the long-range benefits of SI experiences to the academic pursuits and future careers of SI leaders. The opportunity to improve communication skills and develop leadership skills is a strong selling point for many prospective SI leaders. Many students who plan to attend graduate and/or professional schools find that the experience enhanced their scientific knowledge, and found that strategies such as collaborative learning and group work are assets for future educational endeavors.

Conclusion

This study has examined the immediate positive impact of the SI experience on SI leaders and its long-term potential effect on improving

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the learning climate in undergraduate science courses. Based on their lived experiences, SI leaders found the SI experience to be a valuable opportunity that had a significant impact on their approach to learning in other courses and on their perceptions of and relationships with faculty. They also claimed to have developed insight into their own behavior as it was reflected in the group process. The data revealed that the SI leaders valued their experience because of the ways they were able to enrich other students' lives personally and academically. SI leaders act as role models to students and assist in facilitating the learning process through creating a collaborative learning environment. The positive impact of SI on leaders and participants alike contributed to increased involvement and stronger connections with faculty and the academic community, all of which support improved retention (Pascarella & Terenzini, 1991).

Authors' current research investigates the longitudinal impact of the SI leader experience on performance in subsequent courses, on graduation rates, and on eventual career choices. In addition, further qualitative studies are needed to assess the institutional impact of the SI program beyond the SI-supported courses.

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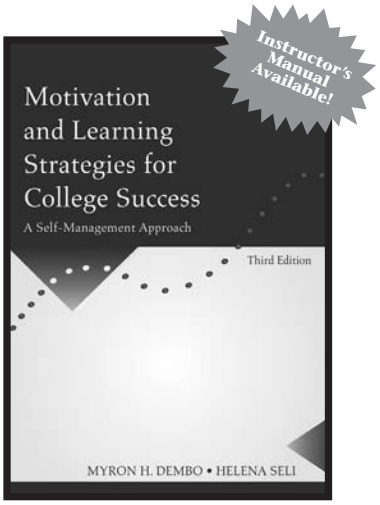

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