Postsecondary Peer Cooperative Learning Programs:

Annotated Bibliography 2014

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Revised 7/28/2014

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Postsecondary Peer Cooperative Learning Program Annotated Bibliography

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Peer collaborative learning has been popular in education for decades. As both pedagogy and learning strategy, it has been frequently adopted and adapted for a wide range of academic content areas at the elementary, secondary, and postsecondary levels due to its benefits. The professional literature is filled with reports of individual professors integrating this approach into postsecondary classrooms in diverse ways. Increased attention has been placed on this practice due to claims that carefully implementing learning programs with specific protocols can increase student persistence rates towards graduation, supporting both student goal aspirations as well as bolstering institutional revenues. Much of the narrative from this overview to the bibliography is drawn from a previously published article published by me on peer cooperative learning groups (Arendale, 2004).

This annotated bibliography does not attempt to be inclusive of this broad field of literature concerning peer collaborative learning. Instead, it is focused intentionally on a subset of the educational practice that shares a common focus with increasing student persistence towards graduation. At the end of this overview, several suggestions are made for differentiating the models from each other and the level of institutional resources and resolve with implementing them.

The six student peer learning programs included in this bibliography meet the following characteristics: (a) implemented at the postsecondary or tertiary level; (b) clear set of systematic procedures for its implementation that could be replicated by another institution; (c) program evaluation studies have been conducted and are available for review; (d) intentionally embeds learning strategy practice along with review of the academic content material; (e) outcomes include increased content knowledge, higher final course grades, higher pass rates, and higher college persistence rates; and (f) the program has been replicated at another institution with similar positive student outcomes. From a review of the professional literature, six programs emerged: (a) ***Accelerated Learning Groups*** (ALGs), (b) ***Emerging Scholars Program*** (ESP), (c) ***Peer-Led Team Learning*** (PLTL), (d) ***Structured Learning Assistance*** (SLA), (e) ***Supplemental Instruction*** (SI), and (f) ***Video-based Supplemental Instruction*** (VSI). As will be described in the following narrative, some of the programs share common history and seek to improve upon previous practices. Other programs were developed independently.

When possible, original text from the author's document overview or summary paragraphs were used in this annotated bibliography. Frequently when peer collaborative programs are adopted for use outside the institution or country of origin, it is often contextualized for the educational system and needs of each individual setting. Nearly one fourth of the entries in this database are from authors and researchers outside of the United States. Sometimes particular program are renamed. For example, while the Supplemental Instruction Program is the common term used in the United States, in other countries it is sometimes called PASS (*Peer Assisted Study Sessions*) or PALS (*Peer Assisted Learning Sessions*). The Emerging Scholars

Program sometimes operates under different names as well. Examples include Treisman Workshop Program and the Gateway Science Program. If the reader of this document is aware of a publication related to one of the peer collaborative learning programs that has not been included or have corrections to the annotations, please contact the compiler/editor by telephone (612-625-2928) or send an e-mail (arendale@umn.edu).

Collaborative Learning, Cooperative Learning & Learning Communities

A review of the professional literature finds that the terms collaborative learning, cooperative learning, and learning communities are often used interchangeably with one another. Although they share similarities with one another, a more precise differentiation is needed to help explore the area and the utility of each for its intended educational outcomes (Cooper, Robinson, & Ball, 2003). Regarding their historical development and appearance within the professional literature in the United States, collaborative learning appeared first, cooperative learning second, and learning communities last. A search of the ERIC Database (2014) found more than 18,000 entries regarding descriptive and research studies that contained one or more of these three terms indexed within their documents.

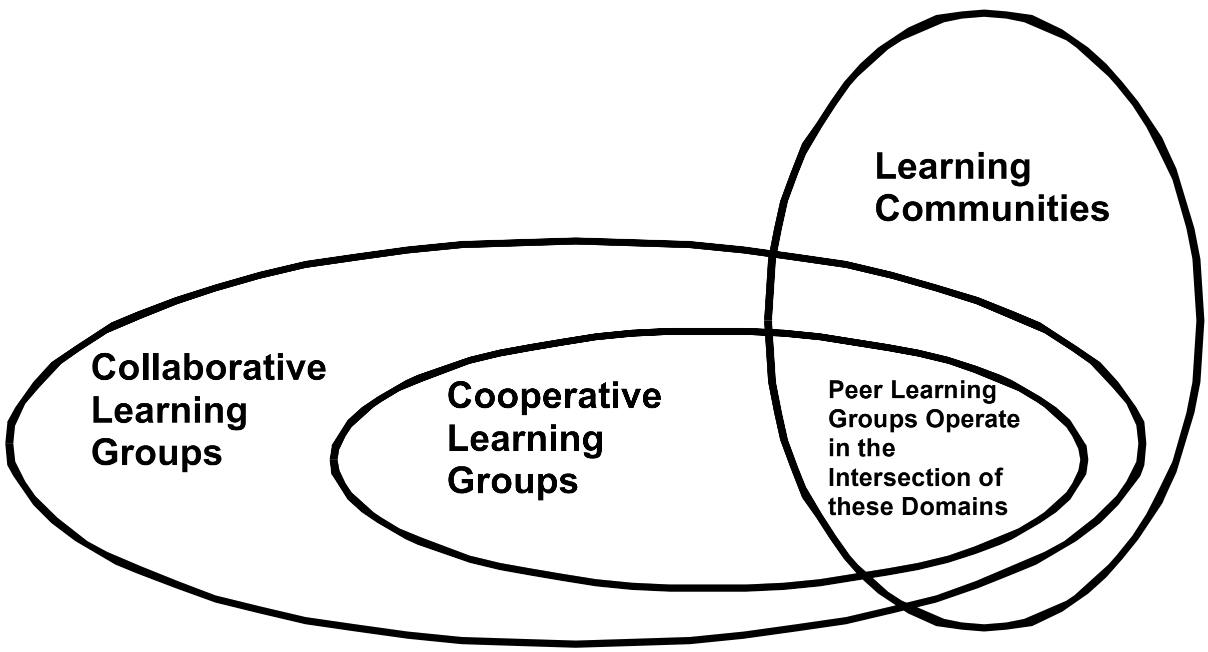
Collaborative learning refers to a wide range of formal and informal activities that include any form of peer student interaction. This is the broadest and most general of the three terms. This term describe any classroom activity by an instructor that involves student peer-to-peer involvement. Cooperative learning is more narrowly defined as a subset of collaborative learning. It often follows these principles: (a) positive interdependence is established in the group through adoption of different roles that support the group moving to complete a goal, (b) peers interact with one another, (c) activities are structured to establish individual accountability and personal responsibility, (d) development of interpersonal and small group skills, and (e) group processing of small group activities through verification of information accuracy (Cuseo, 2002; Johnson, Johnson, Holubec, & Roy, 1984).

Collaborative and cooperative learning groups, learning communities are distinguished by their focus on interactive peer learning. Learning communities often focuse on enhanced curricular and pedagogical outcomes. In addition to often employing some version of student interactive learning, learning communities take several approaches to modifying the classroom experience by restructuring the curriculum. Some of the ways that courses may be modified is through linked courses, learning clusters, freshman interest groups, federated learning communities, and coordinated studies (Gabelnick, MacGregor, Matthews, & Smith, 1990).

A way to understand the relationships among these three terms is through a Venn visual diagram, most often used in mathematics. Collaborative learning is considered the largest construct, both due to its general definition as well as its numerical ranking as most frequently cited in professional literature (ERIC, 2004). A smaller construct lies within collaborative learning. This is cooperative learning. While it holds to the same goals of collaborative learning, it is much more specific in its implementation and following of specified protocols for its use. A related term to both collaborative and cooperative learning is that of learning communities. While learning communities often utilize some peer collaborative or peer cooperative learning activities as part of its pedagogy, it is generally focused more on curricular transformation. However, it is possible to implement some aspects of learning communities without extensive use of either collaborative or cooperative learning since the focus may be more on team teaching by instructors and the integration of academic content material (i.e., cluster course that merges the content of an introduction to science with an ethics course) rather than extensive use of student peer interactive learning activities.

Relationship among Selected Learning Pedagogies

In this bibliography, the focus is with postsecondary peer cooperative learning programs that embed learning strategies practice within review of the academic content



material and which meet the other selection criteria previously mentioned. This is an important topic in the field of developmental education and learning assistance in particular and with postsecondary education in general. This is due to the need by institutions to both meet the needs of a more diverse entering student body while maintaining or increasing academic rigor (Bastedo & Gumport, 2003). The institution must make systemic changes in the educational environment that will increase the academic success and persistence rates of all students to meet the expectations of stakeholders such as parents, legislators, and funding agencies. Although the number of academically underprepared students is increasing, historic delivery systems of academic development for students such as remedial and developmental courses are being reduced or eliminated by some states (Barefoot, 2003; Damashek,1999; Parsad & Lewis, 2003). Many institutions have already adopted one of more of the six programs described in this chapter. The need for such approaches may increase due to the demands to meet the needs of access to an increasingly diverse student body without the traditional approaches offered by developmental education in the past.

Six Major Postsecondary Peer Cooperative Learning Programs

Six postsecondary peer collaborative learning programs were selected for inclusion in this chapter based on the criteria mentioned earlier in the narrative: (a) **Accelerated Learning Groups** (ALGs), (b) ***Emerging Scholars Program*** (ESP), (c) ***Peer-Led Team Learning*** (PLTL), (d) ***Structured Learning Assistance*** (SLA), (e) ***Supplemental Instruction*** (SI), and (f) ***Video-based Supplemental Instruction*** (VSI). The five programs have been divided into two groups.

The first group are those that provide adjunct support through outside-of-class activities with little change by the primary course instructor. The first in this category is SI. In recent years, another program was developed to address limitations of the SI model: SLA. The second group of peer cooperative programs are those that share a common characteristic of a transformed classroom learning environment by all enrolled students. Major changes have been made by the primary course instructor through either integration of the peer learning model into the basic course delivery or heavy involvement by the instructor with the peer learning activities. The first of these programs is ESP, developed at approximately the same time as SI in the 1970s. In the 1990s, two programs were created with similar purposes and protocols to ESP: PLTL and VSI. Most of these six programs cite in their literature reviews references concerning the other peer learning programs as it appears that each have been an incremental improvement upon previous peer learning models.

Categorization, Relationship, and Historical Development of Peer Cooperative Learning Programs

Adjunct to the Course	Embedded Within the Course
1. Supplemental Instruction	1. Emerging Scholars Program
2. Structured Learning Assistance	2. Video-based Supplemental Instruction
3. Accelerated Learning Groups	3. Peer-Led Team Learning

Selecting the Cooperative Learning Model for Institutional Needs

To display the relationship between the six identified peer cooperative learning programs and learning assistance programs in general, it would be helpful to compare them with Keimig's (1983) Hierarchy of Learning Improvement Programs. In the Hierarchy of Learning Improvement Programs, four basic program types are described and ranked, differentiated by the extent by which they are comprehensive in response to the various needs of students and institutionalized into the academic mainstream. Level 1: Isolated courses in remedial skills. Level II: Learning assistance to individual students. Level III: Provides course-related supplementary learning activities outside the class for some objectives. Level IV: Comprehensive learning system in the course.

Using Keimig's hierarchy it is possible to arrange the six peer cooperative programs into the following figure. According to Keimig, the highest level of student outcomes occurs when a comprehensive learning system is integrated throughout the course learning experience. This requires a transformative experience by the institution due to: (a) heavy involvement of the course professor with curriculum development; (b) training, monitoring, and supervision of peer group facilitators; (c) alignment of educational objectives among all course components; (d) changes in institutional and course policies and expectations; (e) release time for professors to complete essential tasks; and (f) stable, long-term institutional funding since outside grants are difficult to obtain or maintain. ESP, PLTL, and VSI fit into this fourth level category. While these programs have a higher likelihood of improved student outcomes, they are also the most demanding of institutional resources and changes in the campus environment.

The next level of programs, according to Keimig, are those that are adjunct to the course and provide support for it through either voluntary or required participation. ALGs, SLA, and SI are placed into this group. The expectancy for results, based on Keimig's model, is not as high as for the level four comprehensive programs as described in the previous paragraph. Nevertheless, ALG, SLA, and SI are predicted to yield higher student outcomes that either individual assistance to students such as tutoring or enrollment in remedial courses. This third category is less expensive and less labor intensive to implement, but may yield lower desired student outcomes.

Placing Postsecondary Peer Cooperative Learning Programs Within Keimig's Hierarchy of Learning Improvement Programs

Levels of Integration	Peer Cooperative Learning Programs	Likelihood of Improved Student Outcomes
Level Four: Comprehensive learning system in the course	ESP, PLTL, and VSI	High
Level Three: Course-related supplementary learning activities	ALG, SI, and SLA	Above average
Level Two: Learning assistance to individual students	Tutoring	Below average
Level One: Isolated courses in remedial skills		Low

Higher levels of institutionalization of peer learning programs require high levels of funding and support from administration and faculty members. This investment may pay high dividends. The future political and economic environment may be supportive for these types of programs for supporting higher student persistence rates in comparison with traditional remedial or developmental education courses which are under considerable pressure for curtailment as described earlier in this chapter. It is recommended that before adoption of any of the six programs, that both a careful review of the published literature be undertaken as well as personal communication with those successfully operating the programs.

Some of the programs, such as PLTL and SI, offer national training workshops to enable other to implement the programs. On site observations can probably be negotiated with any of the six programs. The investment in such telephone and onsite observations will help to reveal the numerous essential elements needs for successful implementation of the specific practice. Often these essential details are not revealed in the published literature which tend to be more focused on statistical studies and not on the detailed implementation protocols. Based on personal experience as a former national training director for one of the six programs (SI), the author of this document recommends careful planning before attempting to implement the programs. While the educational outcomes described in the published literature are replicable, it generally requires careful implementation and constant monitoring to assure continued quality.

Further Research Issues Regarding Peer Cooperative Learning

One of the most perplexing issues facing peer cooperative learning groups is dealing with student motivation and goal orientation. Sometimes the students who could most benefit from the positive effects of peer learning are the ones least likely to participate due to fear of exposing their academic weaknesses to others or even to themselves. Many of these six programs have dealt with the issue through mandatory attendance at sessions. Although brute force does compel attendance, it does not necessarily follow that students willingly adopt the new academic behaviors and implement them in other courses when not under the dictates of program requirements. Exploring the complexity of student motivation is being carefully studied among elementary and secondary education student populations. However this important construct is often ignored in the study of postsecondary education in general, and the provision of learning assistance at the college level, in particular.

Creating peer cooperative learning programs that provide both structure and an environment that encourages students to modify their motivations for learning will require more work by program designers. Too often students have been expected to adopt the expectations and learning conditions of the institution without direct instruction. This literature supports the notion that it is necessary for institutions to implement programs that are more attentive to individual differences among students. Much work has yet to be done.

Overview of the Six Peer Cooperative Learning Programs

Accelerated Learning Groups (ALGs)

Accelerated Learning Groups (ALGs) were developed at the University of Southern California in Los Angeles in the early 1990s by Dr. Sydney Stansbury. ALGs were designed the meet the needs of students who had significant skill or knowledge deficiencies that often inhibited their effective use of other peer collaborative learning programs such as SI. ALGs combined peer-led small group learning activities, assessment, frequent feedback by a learning skills specialist, and development of an individual education plan (IEP) for each students. ALG students were concurrently enrolled in a challenging entry level course while they developed the necessary skills and knowledge prescribed by the IEP. The ALG students were placed into a triad with another student with similar IEP objectives and a peer leader who worked intensely with the students under the supervision of a learning skills specialist. Participation in ALGs continued in the academic term until the learning skills specialist deemed it appropriate to transition into another peer development program such as SI or individual tutoring. The developer of the ALG model, Dr. Sydney Stansbury, can be contacted via email at sydbury@yahoo.com

Emerging Scholars Program (ESP)

Developed at the University of California, Berkeley in the early 1980s, the Emerging Scholars Program (ESP) has often been implemented in mathematics and the sciences. The approach is also known by various names such as the Calculus

Workshop Program, the Mathematics Workshop Program, and the Treisman model after its creator, Philip Uri Treisman. Other names for the program can be found at the following web site, http://merit.illinois.edu/educators_treismanprograms.html The original ESP program has several critical elements: build a cohort community of first-year students of color that is academically-oriented and a source of peer support; provide the cohort with an extensive orientation to the college and with ongoing academic advising; advocate the interests of the cohort and monitor their academic progress and adjustment to the environment; provide the cohort with ongoing supplementary instruction in order to develop independent learning; and link high school-level and undergraduate-level affirmative action efforts. The ESP program has been adopted and adapted by more than 100 institutions across the U.S. While there is no centralized national training office for ESP, the previously mentioned web site above provides contact information for programs operating across the U.S.

Peer-Led Team Learning (PLTL)

Peer-Led Team Learning (PLTL) is an innovative model in science education. PLTL was originally developed at the City University of New York in the mid 1990s. Support through a grant from the National Science Foundation has assisted in the model being adopted by more than 100 institutions. Student-leaders (peers) guide the activities of small groups of students in weekly Workshop meetings. The students work through challenging problems that are designed to be solved cooperatively. The peer leaders are trained to ensure that the students are actively and productively engaged with the material and with each other. This methodology offers a number of educational opportunities: the supportive format encourages questions and discussions that lead to conceptual understanding; students learn to work in teams and to communicate more effectively; peer leaders learn teaching and group management skills.

The following are guiding principles of PLTL: the program is integral to the course through required attendance at two hours of workshop time weekly; peer leaders are trained in group leadership and course content; activities and materials are challenging yet accessible; faculty are deeply involved in the program; physical space and environments are conducive to discussion and learning; and the program has strong support from the institution. The national office for PLTL is hosted at City University of New York, http://pltl.org They host annual training conferences and provide helpful information for others who wish to adopt and implement the model. The Peer-Led Team Learning International Society supports practitioners and institutions implementing PLTL, both in the U.S. and internationally. They host an annual conference that rotates around the globe, http://pltlis.org/

Structured Learning Assistance (SLA)

Initiated in 1994 at Ferris State University (OH), Structured Learning Assistance (SLA) workshops assist students in developing the background needed to connect to the course content and to develop and apply the learning strategies most appropriate to the content area. All students in the targeted classes are required to attend the sessions until they demonstrate content mastery by high marks on unit exams. Attendance becomes optional for these students and continues to be mandatory for others. A faculty development component is also part of SLA which supports higher academic achievement for students. SLA has been recognized through several national awards and is currently supported by a USDOE Grant from the Fund for the Improvement of Postsecondary Education. Results indicated that SLA can significantly improve student pass rates, even for at-risk students. The institution's web site for SLA is http://www.ferris.edu/htmls/academics/sla/

Supplemental Instruction (SI)

The Supplemental Instruction (SI) model of academic assistance helps students in historically difficult classes master content while they develop and integrate learning and study strategies. The program was originally developed at the University of Missouri-Kansas City in 1973 and has been adopted by hundreds of institutions in the U.S. and abroad. 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 participate. There is no stigma attached to SI since *historically difficult courses* rather than *high risk students* are targeted. SI is scalable and can be implemented in one or more courses each academic term.

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*. The web site for the SI center is http://www.umkc.edu/asm/si/index.shtml

Video-based Supplemental Instruction (VSI)

VSI was developed at the University of Missouri-Kansas City in the late 1980s and has been implemented by dozens of institutions in the U.S. and abroad. VSI differs from SI in several respects. The students enroll in required, core curriculum courses. The course professor records all didactic presentations on videotape for use with underprepared students as well as other students who opt for this highly interactive way of learning. Instead of attending the professor's regular lecture classes, students enroll in the *video section* of the professor's course. Students in both sections are held to the same performance standards. Specially designed facilitator and student manuals support the video sections.

VSI students, led by a trained facilitator, start and stop the videotaped presentation at pre-determined times and, in addition, whenever they have a question or want clarification. Professors design the video presentations to include periodic small group assignments to insure mastery of one concept before the next is introduced. Students complete these tasks under the supervision and with the guidance of the facilitator. When the taped lecture resumes, the professor models how he/she thinks about the assigned tasks. In this way, the students have time to construct and verify their understanding as well as compare their own thinking to that of the expert. The web site for the VSI program is http://www.umkc.edu/asm/vsi/index.shtml

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Arendale, D. (2004). Pathways of persistence: A review of postsecondary peer cooperative learning programs. In I. Duranczyk, J. L. Higbee, & D. B. Lundell (Eds.), *Best practices for access and retention in higher education* (pp. 27-40). Minneapolis, MN: Center for Research on Developmental Education and Urban Literacy, General College, University of Minnesota.

Bastedo, M.N., & Gumport, P.J. (2003). Access to what? Mission differentiation and academic stratification in U.S. public higher education. *Higher Education: The International Journal of Higher Education and Educational Planning, 46*(3), 341-359. Retrieved January 15, 2004 from http://www.kluweronline.com/0018-1560

Cooper, J. L., Robinson, P., & Ball, D. B. (Eds.). (2003). *Small group instruction in higher education: Lessons from the past, visions of the future*. Stillwater, OK: New Forums Press.

Cracolice, M. S., & Deming, J. C. (2001). Peer-Led Team Learning. *The Science Teacher, 68*(1), 20-24.

Cuseo, J.B. (2002). *Organizing to collaborate: A taxonomy of higher education practices for promoting interdependence within the classroom, across the campus, and beyond the college*. Stillwater, OK: New Forums Press.

Edgecombe, N. D. (2011). Accelerating the academic achievement of students referred to developmental education. *CCRC Working Paper (Assessment of Evidence Series)*. New York: Community College Research Center, Teachers College, Columbia University. Retrieved from http://hdl.handle.net/10022/AC:P:13142

Gabelnick, F., MacGregor, J., Matthews, R.S., & Smith, B.L. (1990). *Learning communities: Creating connections among students, faculty, and disciplines*. San Francisco: Jossey-Bass.

Johnson, D.W., Johnson, R.T., Holubec, E.J., & Roy, P. (1984). *Circles of learning: Cooperation in the classroom*. Washington, DC: Association for Supervision and Curriculum Development.

Keimig, R. T. (1983). *Raising academic standards: A guide to learning improvement*. ASHE-ERIC Higher Education Report No. 4. Washington, DC: Association for the Study of Higher Education.

Accelerated Learning Groups (ALGs)

Accelerated Learning Groups (ALGs) were developed at the University of Southern California in Los Angeles during the early 1990s by Dr. Sydney Stansbury. ALGs were designed the meet the needs of students who had significant skill or knowledge deficiencies that often inhibited their effective use of other peer collaborative learning programs such as SI. ALGs combined peer-led small group learning activities, assessment, frequent feedback by a learning skills specialist, and development of an individual education plan (IEP) for each students. ALG students were concurrently enrolled in a challenging entry level course while they developed the necessary skills and knowledge prescribed by the IEP. The ALG students were placed into a triad with another student with similar IEP objectives and a peer leader who worked intensely with the students under the supervision of a learning skills specialist. Participation in ALGs continued in the academic term until the learning skills specialist deemed it appropriate to transition into another peer development program such as SI or individual tutoring.

Arendale, D. R. (2004). Pathways of persistence: A review of postsecondary peer cooperative learning programs. In I. M. Duranczyk, J. L. Higbee & D. B. Lundell (Eds.), *Best practices for access and retention in higher education* (pp. 27-42). Minneapolis, MN: Center for Research on Developmental Education, General College, University of Minnesota.Retrieved from http://education.umn.edu/CRDEUL/monographs.html.
This chapter focused intentionally on a subset of the educational practice that share a common focus with increasing student persistence towards graduation. Rather than a meta-analysis of all published research studies, this chapter is a preliminary review and a description of six models. At the end of the chapter several suggestions are made for differentiating the models from each other and the level of institutional resources and resolve with implementing them. The six student peer learning programs included in this chapter meet the following characteristics: (a) the program must have been implemented at the postsecondary or tertiary level, (b) the program has a clear set of systematic procedures for its implementation at an institution, (c) program evaluation studies have been conducted and are available for review, (d) the program intentionally embeds learning strategy practice along with review of the academic content material, (e) the program outcomes include both increased content knowledge with higher persistence rates, and (f) the program has been replicated at another institution with similar positive student outcomes. From a review of the professional literature six programs emerged: Accelerated Learning Groups (ALGs), Emerging Scholars Program (ESP), Peer-Led Team Learning (PLTL), Structured Learning Assistance (SLA), Supplemental Instruction (SI), and Video-based Supplemental Instruction (VSI). As will be described in the following narrative, some of the programs share common history and seek to improve upon previous practices. Other programs were developed independently.

Arendale, D. R. (2009). Course-based Learning Assistance (CLA) program guide. In S. Clark-Thayer & L. P. Cole (Eds.), *NADE self-evaluation guides: Best practice in academic support programs* (2nd ed., pp. 105-138). Clearwater, FL: H&H Publishing.

These program standards provide guidance for management of postsecondary peer cooperative learning programs such as Supplemental Instruction (SI), Structured Learning Assistance (SLA), Emerging Scholars Program (ESP), Peer Assisted Learning Program (PAL), and Peer-led Team Learning (PLTL). These standards were developed through extensive field testing of professionals in the field operating these peer learning programs. There are six sections to the chapter: mission and goals; assessment and evaluation; program design and activities; human resources; and value system. The items within each section are divided between essential (important for any peer learning program) and recommended (useful for some peer learning programs due to their design). A more detailed examination of assessment and evaluation of peer learning programs is provided elsewhere in the larger publication.

Arendale, D. R. (2009). Specific assessment and evaluation protocols for Course-based Learning Assistance (CLA) programs. In S. Clark-Thayer & L. P. Cole (Eds.), *NADE self-evaluation guides: Best practice in academic support programs* (2nd ed., pp. 183-193). Clearwater, FL: H&H Publishing.
These program standards provide guidance for assessment and evaluation of postsecondary peer cooperative learning programs such as Supplemental Instruction (SI), Structured Learning Assistance (SLA), Emerging Scholars Program (ESP), Accelerated Learning Groups (ALGs), Video-based Supplemental Instruction (VSI), and Peer-led Team Learning (PLTL). These standards were developed through extensive field testing of professionals in the field operating these peer learning programs. There are four progressive levels of assessment and evaluation: program activity reports, immediate outcomes, short-term outcomes, and longer-term outcomes. The levels within each section are divided among questions to investigate, data needed for collection for analysis, and finally, analysis procedures. Depending on the particular peer learning program, some of these protocols would be more appropriate than others. A more detailed examination of mission, program design, administration, and other issues related to implementation of peer learning programs is provided elsewhere in the larger publication.

Stansbury, S. L. (2001). Accelerated Learning Groups enhance Supplemental Instruction for at-risk students. *Journal of Developmental Education, 24*(3), 20-22, 24, 26, 28, 40. Available from the author at Sydbury@Yahoo.com.
In order to increase Supplemental Instruction (SI) attendance, Accelerated Learning Groups (ALGs) were developed. A pilot study investigated whether at-risk students who participated in an ALG/SI combination demonstrated higher self-efficacy and SI attendance than those who participated in only SI. Results suggested that at-risk students were more likely to participated in 12 or more SI sessions if they attended an ALG/SI combination than if they attended only SI. In addition, the range of final grades was higher for those who attended an ALG/SI combination than for those who attended only SI. The development of prerequisite skills was essential for the efficacy of SI to serve academically underprepared students who may shun the very academic intervention that would be of most help to them. Additional research is warranted to investigate this area.

Stansbury, S. L. (2001). *How to turn Supplemental Instruction nonparticipants into participants*. Unpublished manuscript. University of Missouri-Kansas City. Kansas City, MO. Available from the author at Sydbury@Yahoo.com
This study investigated the outcomes of the Supplemental Instruction (SI) model with 215 students enrolled in General Biology and 200 students in General Chemistry at the University of Missouri-Kansas City. A variety of preentry attributes were collected from the students including self-reported grade in a previous course of the same academic sequence, mastery goal orientation, performance-approach goal orientation, performance-avoidance goal orientation, self-efficacy, and interest in group study. While the findings were complex, several general statements include: higher SI attendance was correlated with higher final course grades, academically weaker students were less likely to attend SI sessions, academically weaker students reported higher levels of self-efficacy suggesting that they were less likely to accurately assess their strengths and weaknesses. This may also partly explain why these students were less likely to participate in SI sessions. The author recommends that the course professor administer a content-valid pretest during the first class period to provide feedback to all students and hopefully motivate the low scoring students to attend SI sessions. The paper concludes with an overview of Accelerated Learning Groups (ALGs), an intervention designed by the author at the University of Southern California to increase the academic success of at-risk students. The objective of ALGs is to identify students who have below average prerequisite skills for a course and assist them in strengthening these skills while they attend SI. ALGs were designed to work simultaneously with the campus SI program. Procedures for implementing ALGs is provided with data from a study of the effectiveness of ALGs in a chemistry course.

Stansbury, S. L. (n.d.). *Beyond the Supplemental Instruction summary report*. Unpublished manuscript. University of Missouri-Kansas City. Kansas City, MO. Available from the author at Sydbury@Yahoo.com
This handout was used during training workshops conducted by the SI Director of Research and Training. Going beyond the descriptive statistics that were the baseline reporting system, Dr. Stansbury presents a variety of research methods to study SI more deeply to understand the impact of SI. In particular, the role of prior academic achievement and the frequency of SI attendance were critical to understand whether SI was making a statistically significant difference for the participating students regarding their final course grades.

Zulu, C. (2003). A pilot study of Supplemental Instruction for at-risk students at an Historically Black University (HBU) in South Africa. *Association Internationals de Linguistique Appliqu Review, 16*(1), 52-61.
This article discusses a pilot study during 2002 that sought to evaluate the effectiveness of Supplemental Instruction (SI) at the University of North-West, an historically black university in South Africa. The course under investigation was "Introduction to South African Legal Method and Theory" which first-year law students enrolled. Two questions were investigated: does SI have an effect on students' mastery of content? and does SI have an effect on students' perceptions of their mastery of skills? Three measures were used to evaluate SIL pre and posttests of content knowledge, student perceptions, and

final course grades. There was a correlation of higher SI attendance and higher final course grades. The study also revealed barriers and challenges that students experience at the institution. Si was most effective for students who were better prepared academically and for whom English was their first language. These students had more capacity to engage in the SI sessions and gain the most benefit. The author also noted the disadvantage of voluntary SI attendance. Often the students who most needed to be there chose not to attend due to self-reported reluctance to expose their weakness and discomfort due to lacking the skills of the most prepared students. The author recommends that SI attendance be made voluntary and that SI be combined with other academic interventions such as Accelerated Learning Groups developed by Dr. Sydney Stansbury.

Emerging Scholars Program (ESP)

Developed at the University of California, Berkeley in the early 1980s, the Emerging Scholars Program (ESP). ESP is also known as the Calculus Workshop Program, the Mathematics Workshop Program, and the Treisman model after its creator, Philip Uri Treisman. Other names for the program can be found at the following web site, http://merit.illinois.edu/educators_treismanprograms.html The original ESP program has several critical elements: build a cohort community of first-year students of color that is academically-oriented and a source of peer support; provide the cohort with an extensive orientation to the college and with ongoing academic advising; advocate the interests of the cohort and monitor their academic progress and adjustment to the environment; provide the cohort with ongoing supplementary instruction in order to develop independent learning; and link high school-level and undergraduate-level affirmative action efforts. The ESP program has been adopted and adapted by more than 100 institutions across the U.S.

Adams, G. M., & Lisy, J. M. (2007). The Chemistry Merit Program: Reaching, teaching, and retaining students in the chemical sciences. *Journal of Chemical Education, 84*(4), 721-726.
This article describes the Chemistry Merit Program at the University of Illinois at Urbana-Champaign. The program was created to support historically underrepresented students achieve success in chemistry. Long[term and short-term successes of the program are highlighted.

Alexander, B. B., Burda, A. C., & Millar, S. B. (1997). A community approach to learning calculus: Fostering success for underrepresented ethnic minorities in an Emerging Scholars Program. *Journal of Women and Minorities in Science and Engineering, 3*(3), 145-159. (ERIC Document Reproduction Service No. ED408180).
This document contains the final evaluation of the Wisconsin Emerging Scholars Program (ESP) for the year 1993-94. The evaluation report includes an executive summary, a discussion of the parameters of the evaluation including research questions and methods, implementation processes and outcomes for faculty and administrators, student learning processes and outcomes including those indicated by both qualitative and quantitative data; conclusions related to the use of the ESP program; and recommendations related to pedagogical issues, out-of-class issues, and implementation issues. Critical factors for ESP success included the student small group work, the careful construction of the problem worksheets, and the involvement of the faculty members.

Arendale, D. R. (2004). Pathways of persistence: A review of postsecondary peer cooperative learning programs. In I. M. Duranczyk, J. L. Higbee & D. B. Lundell (Eds.), *Best practices for access and retention in higher education* (pp. 27-42). Minneapolis, MN: Center for Research on Developmental Education, General College, University of Minnesota.Retrieved from http://education.umn.edu/CRDEUL/monographs.html.
This chapter focused intentionally on a subset of the educational practice that share a common focus with increasing student persistence towards graduation. Rather than a

meta-analysis of all published research studies, this chapter is a preliminary review and a description of six models. At the end of the chapter several suggestions are made for differentiating the models from each other and the level of institutional resources and resolve with implementing them. The six student peer learning programs included in this chapter meet the following characteristics: (a) the program must have been implemented at the postsecondary or tertiary level, (b) the program has a clear set of systematic procedures for its implementation at an institution, (c) program evaluation studies have been conducted and are available for review, (d) the program intentionally embeds learning strategy practice along with review of the academic content material, (e) the program outcomes include both increased content knowledge with higher persistence rates, and (f) the program has been replicated at another institution with similar positive student outcomes. From a review of the professional literature six programs emerged: Accelerated Learning Groups (ALGs), Emerging Scholars Program (ESP), Peer-Led Team Learning (PLTL), Structured Learning Assistance (SLA), Supplemental Instruction (SI), and Video-based Supplemental Instruction (VSI). As will be described in the following narrative, some of the programs share common history and seek to improve upon previous practices. Other programs were developed independently.

Arendale, D. R. (2009). Course-based Learning Assistance (CLA) program guide. In S. Clark-Thayer & L. P. Cole (Eds.), *NADE self-evaluation guides: Best practice in academic support programs* (2nd ed., pp. 105-138). Clearwater, FL: H&H Publishing. These program standards provide guidance for management of postsecondary peer cooperative learning programs such as Supplemental Instruction (SI), Structured Learning Assistance (SLA), Emerging Scholars Program (ESP), Peer Assisted Learning Program (PAL), and Peer-led Team Learning (PLTL). These standards were developed through extensive field testing of professionals in the field operating these peer learning programs. There are six sections to the chapter: mission and goals; assessment and evaluation; program design and activities; human resources; and value system. The items within each section are divided between essential (important for any peer learning program) and recommended (useful for some peer learning programs due to their design). A more detailed examination of assessment and evaluation of peer learning programs is provided elsewhere in the larger publication.

Arendale, D. R. (2009). Specific assessment and evaluation protocols for Course-based Learning Assistance (CLA) programs. In S. Clark-Thayer & L. P. Cole (Eds.), *NADE self-evaluation guides: Best practice in academic support programs* (2nd ed., pp. 183-193). Clearwater, FL: H&H Publishing.
These program standards provide guidance for assessment and evaluation of postsecondary peer cooperative learning programs such as Supplemental Instruction (SI), Structured Learning Assistance (SLA), Emerging Scholars Program (ESP), Accelerated Learning Groups (ALGs), Video-based Supplemental Instruction (VSI), and Peer-led Team Learning (PLTL). These standards were developed through extensive field testing of professionals in the field operating these peer learning programs. There are four progressive levels of assessment and evaluation: program activity reports, immediate outcomes, short-term outcomes, and longer-term outcomes. The levels

within each section are divided among questions to investigate, data needed for collection for analysis, and finally, analysis procedures. Depending on the particular peer learning program, some of these protocols would be more appropriate than others. A more detailed examination of mission, program design, administration, and other issues related to implementation of peer learning programs is provided elsewhere in the larger publication.

Asera, R. (1988). *The mathematics workshop: A description*. Unpublished manuscript.
This report describes the Mathematics Workshop, also known as the Emerging Scholars Program (ESP), The paper describes the history of the program, the students targeted for participation, the types of activities that occur inside the ESP sessions, samples of the workshop problem sets, and some student perceptions of its benefit.

Asera, R. (1998). Supporting student persistence. *Black Issues in Higher Education, 15*(10), 104.
This article provides a short overview of the Emerging Scholars Program (ESP).

Bonsangue, M. V. (1990). *Long-term effects of the Calculus Workshop model*. Unpublished manuscript. California State University, Fullerton. Fullerton, CA.
This report describes the Calculus Workshop Model, also known as the Emerging Scholars Program (ESP), and displays several research studies conducted concerning a set of research questions. The three questions were: are there effects on academic performance past the first year of college when ESP was available? Does the ESP program merely "skim" the best students or does program participation affect achievement in the course? Are the types of academic and social issues addressed by the ESP program relevant only for underrepresented minority students, or for non-majority students as well? After providing a program description and theoretical underpinning to the model, the paper presents several research studies focused on the previously described research questions. The students in the study were minority and non-minority students enrolled in a first-year calculus course and also were a mathematics-based major at the College of Engineering or the College of Science at California Polytechnic State University, Pomona (also known as Cal Poly). In comparison between ESP and non-ESP participating students, the ESP students earned higher mean grades in first-quarter Calculus, higher rate of persistence in a math/science/engineering major in college, higher mean grade in first two years of Calculus, and lower course attempt ratio in first-year Calculus (lower withdrawal and subsequent reenrollment). The data suggested that self-selection into the program was not a major variable in explaining the positive differences for the ESP participations. In addition, the data suggested the effectiveness of the ESP model for improving academic achievement of female students who are underrepresented in the area of math/science/engineering.

Bonsangue, M. V. (1993). The effects of calculus workshop groups on minority achievement and persistence in mathematics, science, and engineering. *Cooperative Learning and College Teaching Newsletter, 3*(3), 8-9.

This report describes the Academic Excellence Workshop Program, also known as the Emerging Scholars Program (ESP) at California Polytechnic State University (Cal Poly), Ponoma. This articles presents a short summary of a research study investigated four questions: What effect did the workshop have on achievement and persistence of workshop students in first quarter calculus? What effect did the workshop have on achievement and persistence of workshop students in subsequent calculus courses? What effect did the workshop have on achievement and persistence of workshop students within their mathematics-based majors? What socio-academic effects did the workshop experience have as defined and interpreted by workshop students? The students in the study were minority and non-minority students enrolled in a first-year calculus course and also were a mathematics-based major. In comparison between workshop and non-workshop participating students, the workshop students earned higher mean grades in first-quarter Calculus, higher rate of persistence in a math/science/engineering major in college, higher mean grade in first two years of Calculus, and lower course attempt ratio in first-year Calculus (lower withdrawal and subsequent reenrollment). The data suggested that self-selection into the program was not a major variable in explaining the positive differences for the workshop participants. In addition, the data suggested the cost effectiveness of the workshop model by demonstrating the cost savings through lower numbers of students reenrolling in first-year calculus courses due to their initial academic success and progression through their required math course sequence.

Bonsangue, M. V. (1993). The effects of calculus workshop groups on minority achievement and persistence in mathematics, science, and engineering [Dissertation, The Claremont Graduate University, 1992]. *Dissertation Abstracts International, 53*(09), 3132.
The following is a dissertation study from The Claremont Graduate University. Among the most successful academic intervention programs has been the calculus workshop model developed for African-American students at the University of California, Berkeley, by Uri Treisman. The present research represents the first longitudinal investigation of the effects of workshop participation upon persistence and achievement of underrepresented minority students enrolled in mathematics, science, and engineering majors. Based on the Academic Excellence Workshop Program at California Polytechnic State University, Pomona, 133 workshop and 187 non-workshop minority students, including 86 % of Latino ethnicity, were individually tracked throughout their academic careers over a period of five years. There were no statistically significant differences between workshop and non-workshop groups in pre-college academic measures, including SATV, SATM, HSGPA, and precalculus diagnostic test, suggesting no initial academic advantage by either group. Multiple linear path analysis was used to estimate the effects of workshop participation upon achievement and persistence. Within three years after entering the institution, forty percent of the non-workshop students had withdrawn or been academically dismissed from the institution, compared to five percent of the workshop students. Non-workshop students required an average of one full quarter more to complete their three-quarter calculus sequence due to course failure or withdrawal. Ninety-one percent of the workshop students still enrolled in mathematics, science, and engineering majors after three years had completed their

mathematics requirement, compared to fifty-eight percent of the non-workshop students. Interviews with former workshop students indicated that participation in the workshop sessions was of critical importance in adapting to and attaining the level of performance required in their technical courses, as well as building peer communities within their subsequent upper-division courses. Moreover, University fiscal data indicated that the cost of the calculus workshop program was less than the institutional or state costs of course-repeating for the non-workshop students. This study demonstrates that an intervention program promoting academic excellence and peer interaction in academic contexts can directly affect student performance in technical majors independently of pre-intervention cognitive factors. The data strongly suggest that achievement among underrepresented minority students in mathematics, science, and engineering disciplines may be less associated with pre-college ability than with in-college academic experiences and expectations.

Bonsangue, M. V. (1994). An efficacy study of the calculus workshop model. In E. Dubinsky, A. H. Schoenfeld & J. Kaput (Eds.), *Research in collegiate mathematics education I* (pp. 117-137). Providence, RI: American Mathematical Society
This chapter provides an in depth investigation of the Emerging Scholars Program (ESP). Three questions were studied: are there effects on academic performance of students beyond the first year when they are ESP participants; does the ESP program only enroll the best students who would have done well academically; and are the academic and social issues dealt with by the ESP approach important not only for the target population of underrepresented students in the sciences, but actually good pedagogy for all students. In addition to the study, a comprehensive literature review, ESP description, and theoretical basis for ESP is provided. While the self-selection bias issue was an intervening variable that had an impact on program effectiveness, it appears that ESP contributed to higher achievement for the participating students. The results were less clear for the impact on future academic terms. A cost-benefit analysis suggested that ESP reduced dropouts and reenrollment in courses due to poor marks. Both results contributed to lower costs to the institution and made the program cost neutral if not a cost saver.

Bonsangue, M. V., & Drew, D. E. (1990). *Long-term effects of the Calculus Workshop model*. Unpublished manuscript, California State University, Fullerton.
This report describes the Academic Excellence Workshop Program, also known as the Emerging Scholars Program (ESP) at California Polytechnic State University (Cal Poly), Ponoma. A research study investigated four questions: What effect did the workshop have on achievement and persistence of workshop students in first quarter calculus? What effect did the workshop have on achievement and persistence of workshop students in subsequent calculus courses? What effect did the workshop have on achievement and persistence of workshop students within their mathematics-based majors? What socio-academic effects did the workshop experience have as defined and interpreted by workshop students? The students in the study were minority and non-minority students enrolled in a first-year calculus course and also were a mathematics-based major. In comparison between workshop and non-workshop participating students, the workshop students earned higher mean grades in first-

quarter Calculus, higher rate of persistence in a math/science/engineering major in college, higher mean grade in first two years of Calculus, and lower course attempt ratio in first-year Calculus (lower withdrawal and subsequent reenrollment). The data suggested that self-selection into the program was not a major variable in explaining the positive differences for the workshop participants. In addition, the data suggested the cost effectiveness of the workshop model by demonstrating the cost savings through lower numbers of students reenrolling in first-year calculus courses due to their initial academic success and progression through their required math course sequence.

Bonsangue, M. V., & Drew, D. E. (1995). Increasing minority students' success in calculus. In J. Gainen & E. W. Willemsen (Eds.), *Increasing student success in quantitative gateway courses,* (pp. 23-33). New Direction for Teaching and Learning, No. 61. San Francisco: Jossey-Bass
The Emerging Scholars Program (ESP), called the Academic Excellence Workshop at California State Polytechnic University-Ponoma, has supported higher academic outcomes in academic achievement and persistence for nontraditional students in science, math, and engineering majors. The study focused on students enrolled in college calculus which serves as a gatekeeper course for these majors. Higher outcomes were reported for women and Latinos who participated in the program. Procedures for conducting the ESP are also shared. An analysis of the cost effectiveness of the program is documented.

Born, W. K. (2001). The effect of workshop groups on achievement goals and performance in biology: An outcome evaluation [Dissertation, Northwestern University, 2000]. *Dissertation Abstracts International, 61*(11), 6184.
This two-year quasi-experiment contained in a dissertation study from Northwestern University evaluated the effect of peer-led workshop groups on performance of minority and majority undergraduate biology students in a three-course series and investigated motivational explanations for performance differences. The workshop intervention used was modeled after a program pioneered by Treisman (1992) at the University of California. Majority volunteers randomly assigned to workshops ($n = 61$) performed between 1/2 and 1 standard deviation better than those assigned to the control group ($n = 60$; $p < .05$) in each quarter without spending more time studying. During Quarter 1, workshop minority students ($n = 25$) showed a pattern of increasing exam performance in comparison to historic control minority students ($n = 21$), who showed a decreasing pattern ($p < .05$). Although sex differences in biology performance were a focus of investigation, none were detected. Motivational predictions derived from the hierarchical model of approach and avoidance achievement motivation (Elliot & Church, 1997) were partially supported. Self-report survey measures of achievement goals, modeled after those used by Elliot and colleagues, were requested from all enrolled students. Volunteers ($n = 121$) reported higher average levels of approach and avoidance goals than nonvolunteers ($n = 439$; $p < .05$) and the relationship of goals to performance was moderated by volunteer status. Performance of volunteers was negatively related to avoidance of failure goals ($\boldsymbol{r}$ = .41, $<p < .01$) and unrelated to performance approach goals. Performance of nonvolunteers was unrelated to avoidance of failure goals and positively related to performance approach goals ($\boldsymbol{r}$ = .28, $p < .01$). Mastery goals were

unrelated to performance for all students. Results were inconsistent with Dweck and Leggett's (1988) theory of mastery vs. performance orientation, but were similar to results found by Elliot and colleagues. Contrary to hypotheses, motivational goals did not mediate performance for any group of students. Results suggest that challenge interventions can be highly beneficial for both majority and minority participants and that institutions can promote excellence by incorporating workshop programs like the one described here. These interventions have been shown to be more effective and cost less than remedial interventions.

Born, W. K., Revelle, W., & Pinto, L. H. (2002). Improving biology performance with workshop groups. *Journal of Science Education and Technology, 11*(4), 347-365.
This article describes a two-year quasi-experimental study of the effect of a program similar to Emerging Scholars Program (ESP) on both minority and majority students enrolled in an undergraduate biology course. Outcomes from the study include: participants outperformed their nonparticipant counterparts, interest in biology was increased, and a reduction of anxiety. An extensive review of the professional literature identifies factors that may have a negative impact upon minority students including stereotype threat. Included with the data analysis is an investigation of the potential impact of student motivation for both participation and performance.

Chan, S. L. (2011). *An investigation of the conceptual understanding of continuity and derivatives in calculus of Emerging Scholars versus non-Emerging Scholars Program students.* (Master of Sciences thesis), The University of Texas at Arlington, Arlington, Texas.
The Emerging Scholars Program (ESP) has been adapted at colleges and universities across the nation in efforts to increase student access to Science, Technology, Engineering and Mathematics (STEM) disciplines. This study uses a written assessment to gain insight regarding conceptual knowledge on continuity and derivatives for ESP students versus non-ESP students in the same lecture course in first semester calculus at large urban university in the southwest. We analyze the assessment results of 22 ESP and 48 non-ESP students and discuss findings, particularly, those that indicate statistically significant differences regarding continuity over an interval.

Clubine, B. J. (1993). *An evaluation of the Emerging Scholars Program at the University of Texas at Austin: A non-remedial approach to the advancement of minority students and women in mathematics.* (Master of Arts thesis), University of Texas at Austin, Austin, TX.
This MA thesis evaluates the Emerging Scholars Program (ESP) at the University of Texas at Austin. ESP was evaluated in the School of Natural Sciences concerning student involvement in the 1990-91 academic year. The program was found helpful in increasing academic success of historically underrepresented students of color and females in mathematics. Five questions were examined: how do students perceive and respond to the experience of ESP; how does the ESP fit into students' overall experience at the large university; what kinds of secondary school experiences are most instrumental in introducing minority and other students to mathematics and the natural

sciences; what kinds of academic and other experiences confirm them in their choice of science and/or mathematics as an area of endeavor; and what kinds of academic and other experiences lead to their successful commitment to research in mathematics and the natural sciences as life-long careers.

Conciatore, J. (1990). From flunking to mastering calculus: Treisman's retention model proves to be "too good" on some campuses. *Black Issues in Higher Education, 6*(22), 5-6.
This short article describes the Emerging Scholars Program (ESP). The background for the development of ESP is provided through Treisman's observation and research of the study behaviors of students of color who were taking calculus courses. Rather than being offered as a "remedial" program, ESP is presented as an honors program. Some information is provided about the adoption and adaptation of ESP by 24 other colleges in the U.S.

Dancis, J. (1991). Group learning helps minority students excel at university. *Cooperative Learning, 12*(1), 26-27.
This article provides a short overview of the Emerging Scholars Program (ESP). ESP is an honors-type program that challenges students. Key elements in the ESP program are: small group learning; work on interesting hard problems; guidance and mentorship from a faculty member; a comprehensive support system for the participating students; many opportunities to correct the homework problems without grading; peer discussion; requirement that students explain to one another how to understand and solve problems; and minor emphasis on study skills and memorization of facts.

Drew, D. E. (Ed.). (1996). *Aptitude revisited: Rethinking math and science education for America's next century*. Baltimore, MD: John Hopkins University Press. Retrieved from ERIC database. (ED405207).
Chapter six of the book provides an overview to the Emerging Scholars Program (ESP) developed at the University of California, Berkeley.

Duncan, H., & Dick, T. (2000). Collaborative workshop and student academic performance in introductory college mathematics courses: A study of a Treisman model math excel program. *School Science and Mathematics, 100*(7), 365-373.
This article reports on the effectiveness of Math Excel, an implementation of the Emerging Scholars Program (ESP) at Oregon State University over five academic terms. Results suggest a significant effect on achievement favoring the Math Excel students (.671 grade points on a 4-point scale). After adjusting for prior mathematics achievement using linear regression with SAT-M as predictor, Math Excel groups grade averages were over half a grade point better than predicted (significant at the .001 level).

Epperson, J., & Treisman, P. U. (Writers). (2001). Collaborative learning [Video recording]. Arlington, TX: Academy of Distinguished Teachers, University of Texas at Arlington

Fullilove, R. E. (1986). *Sealing the leaks in the pipeline: Improving the performance and persistence of minority students in college*. Unpublished manuscript. University of California, Berkeley. Berkeley, California.
This report provides both an overview of the Emerging Scholars Program (ESP) as well as a research study evaluating its impact upon student outcomes. The initial part of the document provides an overview of the problems with academic success and persistence of students of color with academic majors in math, science, and engineering. Then the report provides an overview of ESP with some details concerning specific activities that occur within the program. The report then concludes with inclusion of several data tables from Uri Treisman's doctoral dissertation study on ESP. The data suggested that ESP participants earned higher grades, persisted longer both at the university as well as within their original SME academic major.

Fullilove, R. E., & Treisman, P. U. (1990). Mathematics achievement among African American undergraduates at the University of California, Berkeley: An evaluation of the Mathematics Workshop Program. *Journal of Negro Education, 59*(3), 63-78.
This article describes the Mathematics Workshop Program (MWP), sometimes also known on other campuses as the Emerging Scholars Program (ESP). Data from the program evaluation between 1978-1984 at the University of California, Berkeley suggested that the program has succeeded in promoting high levels of academic performance among African American mathematics students. To provide comparison data, a baseline of student performance was established during the period of 1973 to 1977 before the ESP program was provided to students. The percentage of nonparticipants earning grades of D or below ranged from 33% to 41%. The participants ranged between 3% to 7% in comparison. The percentage of nonparticipants earning grades of B- or higher ranged from 10% to 28%. The participants ranged between 39% to 61%. The persistence and graduation rates favored the participants, 65% vs. 41%. The study took into account preentry attributes such as SAT scores on the verbal and mathematics subtests.

Ganter, S. L. (1991). Improving the achievement of minorities in mathematics: A formative evaluation of a community college program [Dissertation, University of California, Santa Barbara, 1990]. *Dissertation Abstracts International, 52*(05), 1673.
The following is a dissertation study from the University of California, Santa Barbara. By 1980, the interest for improving mathematics education at the post-secondary level had become so great that a committee was formed by NSF to discover the needs of the mathematics community as seen by educators in the field. The results indicated that a lack of guidance in developing math courses has led to discontinuity and a general state of confusion for many math programs and for the students in them. The Professional Development Program (PDP) is one post-secondary program that has been developed and implemented across the country. This program was conceived by Uri Treisman at UC Berkeley in response to the low completion rate of Black students in freshman calculus. Treisman developed a workshop program that would provide peer support for minority students, as well as other students, in lower division undergraduate mathematics courses. Santa Barbara City College (SBCC), a two-year community college, implemented the workshops developed by Treisman during the 1989-90 school

year in first semester pre-calculus. This study examined the initial implementation and effects of the SBCC program. The major goal was to examine the program's success in increasing the persistence and performance of students in mathematics. It also examined how well the program was implemented, since faulty implementation can jeopardize intended outcomes just as much as a faulty program design. In order to assess the degree to which the program was implemented, each student involved in the workshops was involved in a brief interview to obtain student impressions of the workshops. In addition, weekly observations of the workshop sessions were made and compared to the UC Berkeley workshops. To assess student performance, comparisons were made between workshop and non-workshop students. These comparisons could not be made through random assignment since students volunteered to participate in the workshops. Therefore, it was necessary to make comparisons that utilized matching, a within-subject design. The workshop effect on student performance was then obtained by comparing the student matches in five areas: attrition rates, attitudes toward math, course grades, scores on a posttest, and mathematical understanding as determined by individual interviews. Although the program appears to be successful at UC Berkeley, it was not true that this apparent success was easily transferable to a community college. The major difference in this new setting was that the program was working with an entirely different student population than would be found at most four-year institutions. Many students wanted to, and did, commit to the program only to find that the workshops were very difficult to attend on a regular basis because of job and family commitments. This greatly influenced the effectiveness of the program.

Garland, M. (1983). The Mathematics Workshop Model: An interview with Uri Treisman. *Journal of Developmental Education, 16*(3), 14-16, 18, 20, 22.
This articles provides an interview with Dr. Uri Treisman, creator of the Emerging Scholars Program (ESP) that was initially developed at the University of California, Berkeley. The interview topics include: background and history of the ESP program, core ideas that the program is based upon, structural impediments to success in the curriculum, other ESP programs in the U.S., and related issues.

Hildebrand, J. (1988, 1988, January 24). Math tutor finds strength in numbers, *Chicago Sun-Times,* p. 42.
This newspaper story provides some information about the Emerging Scholars Program (ESP). One of the features of the program is that it is not about surviving calculus, but excelling with the academic content material.

Hobby, B. (1993, 1993, January 25). Professors ease fear of math monster, *Austin American Statesman,* p. A9.
This newspaper article describes the Emerging Scholars Program (ESP) implemented at Rice University. The article provides the rationale for the program and includes quotations from Uri Treisman, originator of ESP.

James, D. W., Jurich, S., & Estes, S. (2001). *Raising minority academic achievement: A compendium of education programs and practices*. Unpublished manuscript. American

Youth Policy Forum. Washington, D.C. Retrieved from http://www.doe.state.la.us/lde/uploads/3434.pdf
This report provides an overview of a wide variety of programs that have been effective for students of color in increasing their academic success in secondary and postsecondary education. The Emerging Scholars Program (ESP) is one of the featured programs with and overview and preliminary data studies included.

Johnson, S. D., & Fischbach, R. M. (1992). *Teaching problem solving and technical mathematics through cognitive apprenticeship at the community college level*. Retrieved from ERIC database. (ED352455)
This report describes a program called "Cognitive Apprenticeship" that is partially based on the Emerging Scholars Program (ESP). The traditional format of mathematics instruction has not succeeded in providing the skills students need to work cooperatively to solve problems in industry. New models of instruction have been proposed to resolve this deficiency. Schoenfeld has used a technique that incorporates coaching, modeling, and fading strategies with college-level students. Treisman has improved minority student performance in calculus using a model based on collaborative problem solving. A hybrid model called cognitive apprenticeship merges the coaching-modeling-fading components of Schoenfeld's model and Treisman's collaborative workshop model to enable students to become better problem solvers while working together as members of a community of learners. Cognitive apprenticeship instruction was tested in community college industrial technology classes: two instructors each taught a traditional and an experimental technical mathematics class. Quantitative data from indicated students in the cognitive apprenticeship group scored slightly better than the control group on a problem-solving exam and the final exam, although not significantly. The scores of the cognitive apprenticeship students on a standardized exam were slightly lower than the control group, but not significantly. Two recommendations were proposed based on the results of the study: first, to explore the model further after certain suggestions were incorporated and second, to test it in other math-based classes. (Contains 61 references.)

Kosciuk, S. (1997). *Impact of the Wisconsin Emerging Scholars first-semester calculus program on grades and retention from Fall 1993-1996*. Unpublished manuscript. University of Wisconsin-Madison. Madison, WI.
The Emerging Scholars Program (ESP) at the University of Wisconsin-Madison was evaluated between 1993 and 1996. The ESP was designed to increase the academic success of students enrolled in several first-semester calculus and persist at higher rates in science, math, engineering, or technology academic majors. The success rate was increased for participating students.

Leapard, B. B. (2001). Affective, metacognitive, and conceptual effects of an Emerging Scholars program on elementary teacher preparation: An application of the Treisman workshop model [Dissertation, The University of Toledo, 2000]. *Dissertation Abstracts International, 61*(10), 3958.
This study addresses the problem of preservice elementary mathematics teaching preparation. It analyzes the effects of an Emerging Scholars program utilizing the

Treisman model. The basic principles of this model include the reconceptualization of mathematical ideas for the under-prepared mathematics student and the emphasis on the social aspect inherent in learning mathematical concepts. The study involves an elementary mathematics content course that was constructivist in nature and which emphasized the tenets of the NCTM Standards Qualitative measures included in the study are student interviews, mathematical autobiographies and classroom observations. Quantitative measures consist of surveys on metacognition and mathematics anxiety and concept maps. Data concerning affective, metacognitive, and conceptual changes was analyzed both qualitatively and quantitatively. Results indicate an increase in metacognitive skills, measured both qualitatively and quantitatively and a decrease in mathematics anxiety levels measured qualitatively. Effects of the program on conceptual understanding are inconclusive. However, a significant increase in the preservice teachers' level of self-confidence in teaching is noted. The Emerging Scholars program appears to have a positive effect on preservice elementary teachers when considering affective and metacognitive attributes related to mathematics but appears to have a neutral effect on the reconceptualization of mathematical ideas. Improvement in affective variables related to teaching elementary mathematics are the most significant effects of the program.

Leggett, J. M. (1998). Linked case studies of the dissemination of the Emerging Scholars Programs in three community colleges [Dissertation, The University of Texas at Austin, 1997]. *Dissertation Abstracts International, 59*(01), 1998.
This dissertation study examined the dissemination attempts of three community colleges in adapting an Emerging Scholars Program (ESP) on their campuses. Using linked case studies, the study focused on the description of the role of faculty and administrators in implementing the Emerging Scholars Program. Of key significance was the perceived need for the ESP, the problem to be addressed, the combined effort used within the institution to adapt the program, how dissemination occurred, and the results obtained. The Emerging Scholars Program evolved from the work of Dr. Philip Uri Treisman, a University of California at Berkeley mathematician, who was intrigued by the success of Asian American students and the lack of success of African American students in freshman calculus. Treisman's study led to the development of a set of strategies and a framework for addressing the persistent under-performance of African American, Hispanic, and Native American students in introductory collegiate mathematics courses. The ESP is an academic excellence program with six characteristic elements. The Emerging Scholars Program focuses on students' strengths rather than their weaknesses. The existence of several well-established Emerging Scholars Programs at four-year institutions has permitted numerous studies on the program. In community colleges, however, the Emerging Scholars Program is still in its infancy, and additional research is needed. The dissemination of the ESP has evolved from a grass roots effort conducted by the Charles A. Dana Center at the University of California at Berkeley to its current broad dissemination through building connections among mathematicians to encourage underrepresented minority students to seek careers in mathematics. A major finding of this study of the dissemination of the ESP in three community colleges is that underrepresented minority and other students who participated in ESP workshops successfully completed courses in mathematics and

the sciences consistently at a success rate up to a grade higher than non-ESP students. Other findings are: (1) the ESP model cannot be translated in its entirety across all sectors of higher education; (2) real creativity is needed to establish an ESP at a community college; (3) stable funding is key in establishing and institutionalizing an ESP; (4) institutional planning, evaluating, and customizing are required in establishing an Emerging Scholars Program; and (5) only a small number of students will be served.

MacGregor, J. (2000). Restructuring large classes to create communities of learners. In J. MacGregor, J. L. Cooper, K. A. Smith & P. Robinson (Eds.), *Strategies for energizing large classes, New Directions for Teaching and Learning, No. 81* (pp. 47-61). San Francisco: Jossey-Bass
This article provides an overview of a variety of programs for providing peer collaborative learning groups either inside or outside the classroom. The Emerging Scholars Program (ESP) and Supplemental Instruction (SI) have several pages of text devoted to both of them providing a basic program overview and several citations to research studies that support their program claims of effectiveness for improved student outcomes.

Mason, K. I., Hrbowski, F. A., & Schmitt, C. L. (2000). African American college students excelling in the sciences: College and postcollege outcomes in the Meyerhoff Scholars Program. *Journal of Research in Science Teaching, 37*(7), 629-654.
This article describes the Meyerhoff Scholars Program at the University of Maryland, Baltimore County which was based on the Emerging Scholars Program (ESP). Outcomes for the participating students are higher grade point averages, higher rates of persistence in science and engineering degrees, and higher rates of admission to graduate schools than nonparticipating students. Critical factors cited by focus groups with participating students included the following: program community, study groups, summer bridge program, financial support, program staff, research internships, and mentors.

McCreary, P. (1994). The Merit Workshop Program in calculus at the University of Illinois at Urbana-Champaign: Description of a successful intervention program for underrepresented groups in mathematics. In A. Solow (Ed.), *Preparing for a new calculus: Conference proceedings* (pp. 80-84). Washington, D.C.: National Academy Press, Mathematics Association of America
This paper reports on Merit Workshop Program at the University of Illinois at Urbana-Champaign. This program is based on the Emerging Scholars Program (ESP). Program participants earn nearly a full letter grade higher final course grades in calculus than similar nonparticipants. The target population for service are historically underrepresented student populations in the sciences. Typical program activities are described.

Merit Immersion for Students and Teachers (MIST). (2007). *Merit instructor mentoring manual*. Unpublished manuscript. University of Illinois at Urbana-Champaign. Champaign, IL. Retrieved from http://merit.illinois.edu/documents/TA%20Mentoring%20Program%20Manual.pdf

The 26-page manual is used for training new MERIT mentors for the Treisman-inspired program. Responsibilities include: (a) Participation in mandatory New Merit Instructor and Mentee Training; (b) Weekly observation by either Mentor or Merit Director for the first four weeks of the semester; (c) Observation once every three weeks there after by Mentor, or possibly more as deemed necessary by Mentor and Merit Director; (d) Observations will last approximately one hour each time; (e) Brief discussion (10 minutes) with Mentor at some time after each observation to discuss; observations, answer any questions, and set goals for subsequent class periods; and (f) Participation in two Performance Reviews with Mentor and Merit Director to discuss progress

Merit Immersion for Students and Teachers (MIST). (2007). *Merit teaching assistant training manual*. Unpublished manuscript. University of Illinois at Urbana-Champaign. Champaign, IL. Retrieved from
http://merit.illinois.edu/documents/TA%20Training%20Manual.pdf
The 38-page manual is used for training new MERIT teachign assistants for the Treisman-inspired program. Topics for training include (a) relationships of the TA with the course professor and the students; (b) campus resources; (c) discussion questions to use during the sessions; (d) first day of the Merit workshop session, (e) evaluation; and (f) program resources.

Merit Immersion for Students and Teachers (MIST). (n.d.). *Merit Program brochure*. Unpublished manuscript. University of Illinois at Urbana-Champaign. Champaign, IL. Retrieved from http://merit.illinois.edu/documents/MIST%20hand-out%2008.pdf
This two-page borchure provices an overview of the MIST Program with its mission, goals, and brief report of the program's evaluation with increasing student success

Merit Immersion for Students and Teachers (MIST). (n.d.). *Merit-style questiosn for classroom use*. Unpublished manuscript. University of Illinois at Urbana-Champaign. Champaign, IL. Retrieved from http://merit.illinois.edu/educators_material.html
This web page provides work sheets and discussion questions to use during the Merit sessions. They are provided for chemistry, integrative biology, and math. The individual pages are downloaded as Word documents so they can be easily revised.

Merit Immersion for Students and Teachers (MIST). (n.d.). *Other Merit programs based on the Treisman Model*. Unpublished manuscript. University of Illinois at Urban-Champaign. Champaign, IL. Retrieved from
http://merit.illinois.edu/educators_treismanprograms.html
The academic support program developed by Dr. Uri Treisman at the University of California-Berkeley operates under a variety of names: Professional Development Program (UC-Berkeley), Emerging Scholars Program (UT-Austin), Merit Immersion for Students and Teachers (MIST, Univ of IL at Urbana-Champaign), Gateway Science Program (Northwestern U), Wisconsin Emerging Scholars (U of WI-Madison), Math Excel Program (U of KY, Northeastern U., Oregon State U., and Portland State U.), Louis Stokes Alliance for Minority Participation (SF State U), Math Merit program (Praire State College), Mathematics Education Reform Initiative for Teachers (West Virginia U.), The Math Forum (Drexel U.), and EOPS Project AIM (Achievement in Mathematics,

Cerritos College). It is suggested to the reader to conduct their own online search of references for the Treisman program under the names described above.

Merit Immersion for Students and Teachers (MIST). (n.d.). *Treisman Workshop Resources*. Unpublished manuscript. University of Illinois at Urbana-Champaign. Champaign, IL. Retrieved from http://bfc.sfsu.edu/cgi-bin/prob.pl?Treisman_Workshop_Resources
This web page provides work sheets, discussion questions, and other resources from Treisman Workshop programs across the U.S.The worksheet archive are in compressed .zip format and are searchable. Links are provides to other web resources.

Merit Immersion for Students and Teachers (MIST). (n.d.). *The Treisman's Model*. Unpublished manuscript. University of Illinois at Urbana-Champaign. Champaign, IL. Retrieved from http://merit.illinois.edu/educators_treisman.html
This short overview provides a summary of the program, several quotations from other articles, and links to ESP programs operating at other institutions.

Millar, S. B. (1996). A community approach to learning calculus: Fostering success for underrepresented ethnic minorities in an Emerging Scholars Program of Work. of Work. Department. University of Wisconsin-Madison. Madison, WI. (ERIC Document Reproduction Service No. ED408180)
This article contains an evaluation of the Emerging Scholars Program (ESP) regarding its utility regarding learning calculus. In addition to focusing on helping students from historically underrepresented populations to be academically successful, ESP also provides a learning community that addresses the problems of isolation and lack of support that nontraditional students may experience.

Millar, S. B., Alexander, B. B., Lewis, H. A., & Levin, J. R. (1995). *Pilot Wisconsin Emerging Scholars Program*. Unpublished manuscript. The University of Wisconsin-Madison. Madison, WI. Retrieved from ERIC database. (ED408179)
This document provides the script for an audio-cassette that contains the final evaluation of the Wisconsin Emerging Scholars Program (ESP) for the year 1993-94. The evaluation report includes an executive summary, a discussion of the parameters of the evaluation including research questions and methods, implementation processes and outcomes for faculty and administrators, student learning processes and outcomes including those indicated by both qualitative and quantitative data; conclusions related to the use of the ESP program; and recommendations related to pedagogical issues, out-of-class issues, and implementation issues. Critical factors for ESP success included the student small group work, the careful construction of the problem worksheets, and the involvement of the faculty members.

Mills, S. R. (1999). Academic excellence workshops in chemistry and physics (Uri Treisman) [Dissertation, The Claremont Graduate University, 1999]. *Dissertation Abstracts International, 60*(06), 1968.
In the mid-1970's, Dr. Uri Treisman, at the University of California, Berkeley, developed an academic excellence workshop program that had important successes in increasing

minority student achievement and persistence in calculus. The present dissertation research is an in-depth study of chemistry and physics workshops at the California State Polytechnic University, Pomona. Data for the first, longitudinal component of this study were obtained by tracking to Spring 1998 all workshop minority students, i.e., Latino, African American, and Native American workshop students, a random sample of non-workshop minority students, and a random sample of non-targeted students, i.e., Anglo and Asian students, enrolled in first-quarter General Chemistry or Physics during specific quarters of 1992 or 1993. Data for the second component were obtained by administering questionnaires, conducting interviews, and observing science students during Fall, 1996. Workshop participation was a significant predictor of first-quarter course grade for minority students in both chemistry and physics, while verbal and mathematics Scholastic Aptitude Test (SAT) scores were not significant predictors of beginning course grade for minority science students. The lack of predictive ability of the SAT and the importance of workshop participation in minority students' beginning science course performance are results with important implications for educators and students. In comparing pre-college achievement measures for workshop and non-targeted students, non-targeted students' mathematics SAT scores were significantly higher than chemistry and physics workshop students' scores. Nonetheless, workshop participation leveled the field as workshop and non-targeted students performed similarly in beginning science courses. Positive impacts of workshop participation on achievement, persistence, efficiency, social integration, and self-confidence support the continued and expanded funding of workshop programs. This research also studied how gender and ethnicity affect attitudes, achievement, and persistence in science courses and mathematics-based majors. College-level females, both minority and non-minority, in science showed no differences from males or were in fact more positive about science than males. However, in interviews, minority females expressed concerns about gender and believed gender to be more important in their science experiences than ethnicity. This research suggests intervention programs to increase the number of females in the science- and technology-based job pipeline can be successful.

Moreno, S. E. (2000). *Keeping the door open: Latino and African American friendships as a resource for university mathematics achievement.* (Ph.D. dissertation), University of Texas at Austin, Austin, TX.
The Emerging Scholars Program (ESP) is a critical factors in the academic success of historically underrepresented student populations in mathematics courses. This dissertation study delves into the critical factors that help explain the utility of ESP for supporting higher student achievement. The focus for the study is with students enrolled in a calculus course. The friendships and relationships among students are analyzed for their potential impact on encouraging higher student achievement. Results suggest that students who form strong bonds with fellow students within the ESP program are more likely to earn higher grades. An additional layer of analysis also takes into account cultural factors related to the students racial background for the importance of friendship bonds.

Moreno, S. E., & Muller, C. (1999). Success and diversity: The transition through first-year calculus in the university. *American Journal of Education, 108*(1), 30-57.

This article analyzes the influence at the University of Texas at Austin of calculus performance on choosing a mathematics, science, or engineering major, noting the role of diverse students' participation in the Emerging Scholars Program (ESP) at the University of Texas-Austin. Findings suggest that ESP students earn higher calculus grades than other students and are more likely to enroll in second-semester calculus. While targeted for African-Americans, Latinos, and females, the ESP program is open to all students.

Moreno, S. E., Muller, C., Asera, R., Wyatt, L., & Epperson, J. (1999). Supporting minority mathematics achievement: The Emerging Scholars Program at The University of Texas at Austin. *Journal of Women and Minorities in Science and Engineering, 5*(1), 53-66.
The Emerging Scholars Program (ESP) at the University of Texas at Austin works to improve the academic achievement of minorities and women in calculus, though it is open to all students. Research studies suggest that ESP students are more likely to earn A or B grades in calculus and pass the next course in the academic sequence than non-participants. Six elements of ESP include: increased class time on task; more personal interaction with peers, graduate students, and faculty; fostering of a student community that is supportive; explores more challenging aspects of mathematics; provides academic advising; and allows students to concentrate on and excel in a smaller number of challenging classes since they receive academic credit for participation in the ESP program.

Murphy, T. J. (1986). College mathematics instruction in transition: A study of reform in a college algebra course for 'at-risk' students [Dissertation, University of Illinois at Urbana-Champaign, 1995]. *Dissertation Abstracts International, 56*(09), 3491.
This dissertation study investigates the Emerging Scholars Program. Historically, students from academically disadvantaged and minority populations have experienced disproportionately high dropout and failure rates in college mathematics. These students often place into courses considered remedial at the college level. The current national reform movement includes initiatives designed to address the failure of mathematics education to meet the needs of underrepresented populations. This research examined an effort to make a college algebra course more effective for 'at-risk' students, admitted to a research university through an academic support program. In particular, the study analyzed the extent of reform in this course and the impact of the course on student outcomes, and identified barriers and enhancers to implementing reform in this context. The reform efforts included employing active learning and student collaboration strategies and attempting to create a 'Treisman-style' workshop environment. These strategies challenge instructors to check their impulse to show and tell, and instead, to facilitate and coach; correspondingly, instructors design challenging activities that differ from the standard manipulation exercises often found in textbooks. This study followed an instructor through her first semester of attempting to implement these strategies. A combination of retrospective and prospective data was utilized. Admissions and transcript records enabled the calculation of background characteristics (demographic and academic) and persistence rates (university retention and course and career paths). Prospective data included classroom observations, instructor and

researcher journals, a diagnostic pre- and posttest, and student interviews. The results indicated that (a) the academic support program provided a supportive, inclusive environment for both students and instructor; (b) the course employed active learning and student collaboration, but the content presented remained at lower cognitive levels; (c) the instructor experienced frustration in trying to balance content coverage with student involvement, in learning to release control to the students, and in discarding traditional notions of remediation; and (d) the treatment did not adversely affect student skills or attitude, and in some cases the course enabled students to pursue their chosen fields. Recommendations include upgrading the cognitive level of the course content, providing instructor development opportunities, and--most importantly--strengthening partnerships between the units involved (program, department, and instructor) in the conduct of the course.

Murphy, T. J., Stafford, K. L., & McCreary, P. (1998). Subsequent course and degree paths of students in a Treisman-style workshop calculus program. *Journal of Women and Minorities in Science and Engineering, 4*(4), 381-396.
The Merit Workshop Calculus Program, based on the Emerging Scholars Program (ESP), was created in 1989 to increase success rates of students from underrepresented populations in mathematics- and science-based academic majors at the University of Illinois, Urbana Champaign. The research study investigated academic performance in first-semester calculus courses, academic performance in courses that require first-semester calculus as a prerequisite, and persistence at the university. Analysis included gender and ethnicity. Positive results were reported for females, African-Americans, Caucasian, and Hispanic students. Dramatic results were reported for females and Hispanics.

Mwavita, M. (1994). *Factors influencing calculus course success among freshmen engineering students.* (Ph.D. dissertation), University of Central Florida, Edmond, OK.
The Emerging Scholars Program along with a Summer Bridger Program were important components for increasing student academic success.

Nelson, C. E. (1996). Student diversity requires different approaches to college teaching, even in math and science. *American Behavioral Scientist, 40*(2), 165-175.
The author argues that traditional teaching pedagogies are biased against many non-traditional student populations. Among the changes in the learning environment recommended by the author is the Emerging Scholars Program (ESP). The short description of ESP includes a discussion about the importance of changing the social system for the historically underrepresented students to succeed at the institution. Careful distinction is drawn between traditional recitation sessions which often evoke passive student involvement and structured sessions in ESP where students are highly participatory in the learning process.

Oppland, S. B. (2010). *The inextricability of identity, participation, and math learning among Latino/a undergraduate students.* (Ph.D. dissertation), University of Illinois at Chicago, Chicago, Illinois.

This study holistically explores the experiences of two Latino/a undergraduate freshman pursuing or interested in pursuing STEM majors as they engage in an Emerging Scholars Program (ESP) Calculus I workshop; a mathematical community of practice recognized for assisting culturally diverse student groups in realizing mathematical success. The study presents a theoretical framework for exploring intersections among participants' narrative and participative identities to gain knowledge about how and why relationships among their multiple identities, participation, and access to math learning opportunities unfold and strengthen as they engage in a particular mathematical community of practice. Using counter story-telling methodology and life story interviews, this study describes through the participants' voices how their math identities intersect with their racial, cultural, gender, and class identities, separately and collectively, as they negotiate intricate experiences in and across societal, community, school, and family contexts throughout their lives. By applying multiple data sources to Wenger's (1998) social ecology of identity framework, this study also describes how the participants construct identities of participation and marginalization as workshop members and as appropriators of mathematical knowledge. Using in-depth case studies, this study explores how and why strengthened relationships form among the participants' identities as math learners, their participatory trajectories, and opportunities to learn mathematics in the ESP workshop over the course of a semester. A model is presented for each student that explicates these relationships. This research raised important considerations regarding the relationships that exist among Latino/a students' multiple identities, participation, and math learning. This includes the roles of racialized, cultural, gendered, and classed experiences; racial, culture, gender, and class identities; and the influence of private and socially (e.g., societal) constructed meanings of what it means to "be Latino/a" in relation to math participation and learning. This research also aims to contribute to building momentum for shifting the focus in the math education community away from underrepresented students' math achievement and persistence outcomes towards viewing their math success as strengthened relationships among their multiple identities, their participatory trajectories, and their ability to access math learning opportunities within and across various communities of practice.

Raspberry, W. (1999, 1999, February 8). Mechanics of a 'miracle', *The Washington Post,* p. A19.
This newspaper article describes the Emerging Scholars Program (ESP) and its historical origins.

Staff. (1995, 1995, August 6). Emerging Scholars Program produces success: Students seeking to improve grades get support, guidance, *Syracuse Herald American,* p. C1.
This newspaper article describes the use of the Emerging Scholars Program (ESP) at the State University of New York-Morrisville to improve student success in math courses by historically underrepresented students.

Staff. (1999). So much for the theory that Blacks can"t do mathematics. *The Journal of Blacks in Higher Education*(25), 48-49.

This article provides the rationale for the Emerging Scholars Program (ESP). It provides an interview with Dr. Treisman who originated the ESP approach to increasing the success of Blacks and other historically underrepresented populations in math courses. A summary of the success of ESP at the University of California-Berkeley is provided.

Treisman, P. U. (1983). Improving the performance of minority students in college-level mathematics. *Innovation Abstracts, 5*(17). Retrieved from ERIC database. (ED234874). This article provides an overview to the Emerging Scholars Program (ESP) developed at the University of California, Berkeley. ESP has five functions: Building a community of minority freshmen that is academically oriented and a source of peer support; Providing minority students with an extensive orientation to the University, and with ongoing academic advising; Monitoring of student academic progress and their adjustment to the University environment, and advocating students; collective and individual interests; Providing minority freshmen with ongoing supplementary instruction in reading the technical language of mathematics; and linking high school-level and undergraduate-level affirmative action efforts.

Treisman, P. U. (1985). A model academic support system. In R. B. Landis (Ed.), *Improving the retention and graduation of minorities in engineering handbook*.(ERIC Document Reproduction Service No. ED259042).
This chapter provides an overview to the Emerging Scholars Program (ESP) developed at the University of California, Berkeley. The program has four objectives: build a community of minority freshmen that focuses on achieving academic excellence and that becomes a source of peer support; provide extensive, year-long supplementary instruction for minority students; orient minority students to the university and to assist their adjustment, where necessary, to advocate their collective and individual interests; and monitor the students' academic progress and to furnish ongoing academic advising. The mechanics of establishing the program, recruiting students, training facilitators, and monitoring the workshop activities is provided. The chapter concludes with several data studies concerning academic achievement of the Chicano and African-American students. A sample worksheet is provided in the appendix.

Treisman, P. U. (1986). A study of the mathematics performance of Black students at the University of California, Berkeley [Dissertation, University of California, Berkeley, 1985]. *Dissertation Abstracts International, 47*(05), 1641.
The following is a dissertation study from the University of California, Berkeley. Freshman mathematics courses have all-too-often been a burial ground for the aspirations of many minority students who have entered college with the goal of majoring in some area of engineering, medicine, or natural or mathematical science. The Professional Development Program (PDP) Mathematics Workshop, a project of the U.C. Berkeley faculty, challenges remedial approaches to assisting such students and provides instead a novel honors program promoting academic excellence and the development of leadership skills. The PDP program was be renamed on other campuses: Emerging Scholars Program, Treisman model, Gateway Science workshop, among others. Specifically, students obtain instruction, sympathetic and knowledgeable academic and personal counseling, intensive study experience in a peer group, and aid

in threading the bureaucratic maze. Since its inception in 1978, the Workshop has had a dramatic effect both on minority students' performance in mathematics and on their persistence in the University. Chapter I of this dissertation describes the development of the PDP Workshop Program and explains the author's assumptions and methods. The status of black students in University mathematics courses is analyzed; their isolated studying behavior is contrasted with the collective studying of identified groups of successful students. Additional barriers to blacks' success in mathematics courses are enumerated. A pilot project, conducted in 1977-78 and involving both academic and non-academic support for a small number of black students is described. Chapter II describes the PDP mathematics Workshop. It details the Workshop's basic elements: a focus on excellence rather than on avoiding failure, an emphasis on collaborative learning, and faculty sponsorship. The recruitment and orientation procedures and instructional strategies employed during the Workshop sessions are described. Chapter III describes the extent to which the Workshop program has met its goals. It concludes that the average Math 1A grade earned by black Workshop participants is consistently above one full grade higher than that earned by black students who did not participate in the program. Moreover, this finding holds true in comparisons involving the following categories of students: regular vs. special admits, Educational Opportunity Program (EOP) vs. non-EOP, College of Engineering vs. others, males vs. females, and low vs. medium vs. high mathematics Scholastic Aptitude Test scores. Other evidence of the program's success includes elevated rates of graduation from the University, and graduation with a math-based degree.

Treisman, P. U. (1989). Mathematics workshop revamped. *UME Trends*, 8-9.
This short article describes the Emerging Scholars Program (ESP) and how it has been redesigned to meet current needs of students. Changes in ESP included permitting non minority students to participate, increasing the frequency of the workshops meetings from two to five times weekly, and the use of teaching assistants to facilitate the sessions. These changes were made in response to the need to produce more math, science, and engineering students.

Treisman, P. U. (1990). *Improving academic performance in mathematics.* Conference Proceedings of the The freshman year in science and engineering: Old problems, new perspectives for research universities, Ann Arbor, MI. (ERIC Document Reproduction Service No. ED352249)
This chapter provides a short overview to the Emerging Scholars Program (ESP) developed at the University of California, Berkeley.

Treisman, P. U. (1992). Studying students studying calculus: A look at the lives of minority mathematics students in college. *College Mathematics Journal, 23*(5), 362-372. Retrieved from http://bfc.sfsu.edu/cgi-bin/prob.pl?Uri_Treismans_Dolciani_Lecture.
This article describes a project that addresses the problem of the failure of African-America and Hispanic students in calculus. The proposed solution is offering students of color a combination of workshops with intensified sections of the calculus course that challenges the students. The author reviews the history of the Emerging Scholars Program (ESP) developed at the University of California, Berkeley. The early part of the

article describes his findings that led to creation of ESP: many Black and Latino students desired to major in math and science but few completed their introductory courses; prevailing ideas about why minority students failed were inaccurate; affirmative action programs were not producing math and science majors; and many minority students did not use the academic services designed to serve them. As a result of the author's research, the ESP program was crafted to meet the needs of minority math and science students. Rather than trying to change students, the author concluded that it was the institution that needed to make significant changes in the learning environment.

Walker, D. R. (2003). *Combating isolation, enhancing success: Emerging Scholars Program in chemistry.* Conference Proceedings of the 226th American Chemical Society National Meeting, New York, NY. For more information, contact the author at the Chemistry Department and Biochemistry, The University of Texas at Austin, A5300, Austin, TX 78712, drwalker@austin.cc.tx.us
The Emerging Scholars Program (ESP) was implemented with an introductory chemistry course at the University of Texas at Austin. The paper discusses positive student outcomes as well as program implementation challenges.

Watkins, B. T. (1989). Many campuses now challenging minority students to excel in math and science. *Chronicle of Higher Education, 35*(40), A13, 16-17.
This newspaper story describes the adoption of the Emerging Scholars Program (ESP) at other institutions to increase the academic achievement of students of color enrolled in math and science courses. It provides a short history of the development of ESP by Uri Treisman at the University of California, Berkeley.

Wheeler, D. L. (1992). Teaching calculus to minority students helps them stay in college. *Chronicle of Higher Education*, A15.
This short account about the Emerging Scholars Program (ESP) describes its impact upon student persistence. It was estimated that 125 colleges have implemented some form of ESP to improve academic achievement of students.

Zumdahl, S. A. (1996). Mission impossible? Improving retention of science majors among minorities and women. *Journal of Chemical Education, 73*, 266-267.
This article describes the Merit Program for Emerging Scholars (MPES) in chemistry at the University of Illinois at Urbana-Champaign. MPES was established to improve retention of science majors among students of color and women. Research studies suggests that participants outperform nonparticipants.

Peer-Led Team Learning (PLTL)

Peer-Led Team Learning (PLTL) is an innovative model in science education. PLTL was originally developed at the City University of New York in the mid-1990s. Support through a grant from the National Science Foundation has assisted in the model being adopted by more than 100 institutions. Student-leaders (peers) guide the activities of small groups of students in weekly Workshop meetings. The students work through challenging problems that are designed to be solved cooperatively. The peer leaders are trained to ensure that the students are actively and productively engaged with the material and with each other. This methodology offers a number of educational opportunities: the supportive format encourages questions and discussions that lead to conceptual understanding; students learn to work in teams and to communicate more effectively; peer leaders learn teaching and group management skills. The national office for PLTL can be accessed at http://pltl.org

The following are guiding principles of PLTL: the program is integral to the course through required attendance at two hours of workshop time weekly; peer leaders are trained in group leadership and course content; activities and materials are challenging yet accessible; faculty are deeply involved in the program; physical space and environments are conducive to discussion and learning; and the program has strong support from the institution.

Acosta, C., Becvar, J. E., & Saupe, G. B. (2012). *Workshop bonding via the group project.* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Acosta-2012.docx
The Peer-Led Team Learning Program at the University of Texas at El Paso (UTEP) encourages peer leaders to develop many different methodologies to guide the students to better understand the subject material and to utilize the resources available to make students in Workshop better students. This is especially important because the majority of the students taking the course are freshman students. Each student learns in a slightly different way. For four semesters, the first author utilized a strategy called the 'Group Project' to promote student learning and personal review of the material. The Group Project provided a mechanism for students to learn how to employ resources beyond the text and how to work in a group as a team. The Group Project served as a tool for students to develop long-term study groups that the first author often observed working as functional study units in later semesters.

Adamczeski, M., & Fuller, H. (2001, 2001, April 1-5). *Peer-led Team Learning as a method to improve student attitudes and perceptions in science.* Conference Proceedings of the 2001 American Chemical Society National Meeting, San Diego, CA. For more information, contact the authors at the Department of Math and Science, San Jose City College, 2100 Moorpark Avenue, San Jose, CA 95128, email: madeline.adamczeski@sjeccd.cc.ca.us
Peer-led Team Learning (PLTL) is used at San Jose City College (CA) in chemistry courses. PLTL is offered as a separate one credit pass/no pass course. Several research studies have been conducted with the program: impact with student peer facilitators, grade achievement by student participants.

Adamczeski, M., Ibrahim, S., Santos, P., Castille, A., Kreig, M., & Tran, L. (2004). *Peer-led Team Learning: Implementation into the first and second semester of general, organic, and biological chemistry curriculum at San Jose City College.* Conference Proceedings of the 227th American Chemical Society National Meeting, Anaheim, CA. For more information, contact the authors at the Department of Math and Science, San Jose City College, 2100 Moorpark Ave., San Jose, CA 95128, email: madeline.adamczeski@sjcc.edu
Peer-led Team Learning (PLTL) was used in introductory courses in general, organic, and biological chemistry courses at San Jose City College. Research studies suggest higher student grades, higher levels of persistence,.

Alberte, J., Cruz, A., Rodgriguez, N., & Pitzer, T. (2012). *Hub n' spokes: A model for centralized organization of PLTL at Florida International University.* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Alberte-2-2012.docx
Peer-Led Team Learning (PLTL) at Florida International University (FIU) is an active learning component added to several courses within the Department of Biological Sciences. Since its inception in 2000, the program’s model has evolved to accommodate a large volume of students and courses. FIU utilizes a centralized model in the administration of the program. This office manages every aspect of the PLTL workshops, ensuring the standardization and overall quality of workshops across all course subjects. Ourmodel reduces faculty’s time commitment and allows for a student-centered administration. This model of administration is a key factor in FIU PLTL becoming a self-sustaining, institutionalized component of undergraduate biology education.

Alberte, J. L., Cruz, A., Rodriguez, N., & Pitzer, T. (2012). *PLTL in pajamas: Lessons learned.* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Alberte-2012.docx
Peer-Led Team Learning (PLTL) in the Biology Department at Florida International University (FIU) incorporates the use of “cyber” learning (cPLTL). Using laptops and cameras, students and Peer Leaders communicate in real time, fulfilling the requirements of the standard model of PLTL. Participants are trained in the use of required software and technology. Initial observations indicate that students perform at least as well in cPLTL as in traditional workshops. Students who cannot or will not attend in-person PLTL workshops are able to take advantage of the boost. FIU is successfully moving toward cPLTL institutionalization alongside the in-person model.

Alberte, J. L., Cruz, A., Rodriguez, N., & Pitzer, T. (2012). *The PLTL leader boost.* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Alberte-3-2012.docx

Qualitative data has demonstrated the impact of PLTL on a Peer Leader's academic performance. In this paper we quantitatively show the presence of the Peer Leader boost at Florida International University. Just as in any apprenticeship role, Peer Leaders undergo an extensive training program and it is this experience which provides an advantage. Training includes pedagogy, classroom dynamics, science concepts, and critical thinking skills equipping Peer Leaders with the necessary skills to manage a productive active learning environment. Initial observations and feedback indicate that participation as a Peer Leader adds value such as enculturation in the discipline, increased performance in traditionally assessed learning outcomes, and increased retention within the discipline. Preliminary data demonstrates a significant difference in the academic success of Peer Leaders in their own course work. This analysis was performed on large enrollment upper-level courses which indicated up to a letter grade difference between Peer Leaders and non-Peer Leaders.

Aldridge, J. N. (2011). *From access to success in science: An academic-student affairs intervention for undergraduate freshmen biology students.* (Ed. D. dissertation), University of Delaware.
The first year experience is known to present an array of challenges for traditional college students. In particular, freshmen who major in a STEM discipline have their own unique set of challenges when they transition from high school science and math to college science and math; especially chemistry. As a result, students may encounter negative experiences which lower academic and social confidence. This project was designed as a pilot study intervention for a small group of freshmen biology students who were considered academically at-risk due their math SAT scores. The study occurred during the fall semester involving an enhanced active learning component based on the Peer-led Team Learning (PLTL) general chemistry supplemental pedagogy model, and a biology-focused First Year Experience (FYE). PLTL workshops took place in freshmen residence halls, creating a live-n-learn community environment. Mid-term and final chemistry grades and final math grades were collected to measure academic progress. Self-reporting surveys and journals were used to encourage participants to reconstruct their experiences and perceptions of the study. Descriptive analysis was performed to measure statistical significance between midterm and final grade performance, and a general inductive qualitative method was used to determine academic and social confidence as well as experiences and perceptions of the project. Findings of this project revealed a statistically significant improvement between chemistry midterm and final grades of the sample participants. Although academic confidence did not increase, results reveal that social confidence progressed as the majority of students developed a value for studying in groups.

Aline, F., Zeng, S., & Yu, Y. M. (2012). *Using Bloom's Taxonomy in a peer-led workshop in probability and statistics.* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Aline-2012.docx
Bloom's Taxonomy goes hand in hand with the peer-led workshop's methods by providing us as peer leaders with a structured order of the learning levels taken to extend our learning capabilities. We, the Peer Leaders, assist students into progressing

to the next level in mathematics by going beyond recalling, understanding and applying (Levels 1-3 of Bloom's Taxonomy). In our Probability and Statistics I and II workshop, we apply Bloom's Taxonomy to help the students, especially with the application of comprehension, application, and analysis (Levels 2-4). By proposing questions to the students, we initiate the recollection of the subject at hand. As a result, these questions help the establishment and encouragement of critical thinking for the students, especially in the higher levels. The Analytical level (Level 4) specifically shows that an individual can know whether what he or she is doing allows them to perform well in the subject.

Allen, D., & Tanner, K. (2005). Infusing active learning into the large-enrollment biology class: Seven strategies, from the simple to complex. *Cell Biology Education, 4*(4), 262-268. Retrieved from
http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1305885.
This article describes seven approaches to improving the quality of learning in a large biology class. Peer-led Team Learning (PLTL) is one of the seven. The narrative provides a basic overview of the program.

Allen, D. E., & White, H. B. (2001). Peer facilitators of in-class groups: Adapting problem-based learning to the undergraduate setting. In J. E. Miller, J. E. Groccia & M. S. Miller (Eds.), *Student assisted teaching: A guide to faculty-student teamwork*. Bolton, MA: Anker Publications

Aponie, Y., Castro, L., Naldik, Y., Melendex, D., & Feliu, L. (2002). *Organic chem-e-chem, a Peer-led Team Learning mentoring/tutoring program in organic chemistry at Universidad Metropolitana.* Conference Proceedings of the 223rd American Chemical Society National Meeting, Orlando, FL.
Peer-led Team Learning (PLTL) has been used at the Metropolitan University of Puerto Rico to support higher student achievement in introductory chemistry courses. The institutional name for the program is Chem-2-Chem. Participating students earn higher rates of quality grades (A, B, C) and lower rates of D, F, or withdrawals. Both participants and student peer leaders report improved morale and self-esteem.

Arendale, D. R. (2004). Pathways of persistence: A review of postsecondary peer cooperative learning programs. In I. M. Duranczyk, J. L. Higbee & D. B. Lundell (Eds.), *Best practices for access and retention in higher education* (pp. 27-42). Minneapolis, MN: Center for Research on Developmental Education, General College, University of Minnesota.Retrieved from http://education.umn.edu/CRDEUL/monographs.html.
This chapter focused intentionally on a subset of the educational practice that share a common focus with increasing student persistence towards graduation. Rather than a meta-analysis of all published research studies, this chapter is a preliminary review and a description of six models. At the end of the chapter several suggestions are made for differentiating the models from each other and the level of institutional resources and resolve with implementing them. The six student peer learning programs included in this chapter meet the following characteristics: (a) the program must have been implemented at the postsecondary or tertiary level, (b) the program has a clear set of

systematic procedures for its implementation at an institution, (c) program evaluation studies have been conducted and are available for review, (d) the program intentionally embeds learning strategy practice along with review of the academic content material, (e) the program outcomes include both increased content knowledge with higher persistence rates, and (f) the program has been replicated at another institution with similar positive student outcomes. From a review of the professional literature six programs emerged: Accelerated Learning Groups (ALGs), Emerging Scholars Program (ESP), Peer-Led Team Learning (PLTL), Structured Learning Assistance (SLA), Supplemental Instruction (SI), and Video-based Supplemental Instruction (VSI). As will be described in the following narrative, some of the programs share common history and seek to improve upon previous practices. Other programs were developed independently.

Arendale, D. R. (2009). Course-based Learning Assistance (CLA) program guide. In S. Clark-Thayer & L. P. Cole (Eds.), *NADE self-evaluation guides: Best practice in academic support programs* (2nd ed., pp. 105-138). Clearwater, FL: H&H Publishing.
These program standards provide guidance for management of postsecondary peer cooperative learning programs such as Supplemental Instruction (SI), Structured Learning Assistance (SLA), Emerging Scholars Program (ESP), Peer Assisted Learning Program (PAL), and Peer-led Team Learning (PLTL). These standards were developed through extensive field testing of professionals in the field operating these peer learning programs. There are six sections to the chapter: mission and goals; assessment and evaluation; program design and activities; human resources; and value system. The items within each section are divided between essential (important for any peer learning program) and recommended (useful for some peer learning programs due to their design). A more detailed examination of assessment and evaluation of peer learning programs is provided elsewhere in the larger publication.

Arendale, D. R. (2009). Specific assessment and evaluation protocols for Course-based Learning Assistance (CLA) programs. In S. Clark-Thayer & L. P. Cole (Eds.), *NADE self-evaluation guides: Best practice in academic support programs* (2nd ed., pp. 183-193). Clearwater, FL: H&H Publishing.
These program standards provide guidance for assessment and evaluation of postsecondary peer cooperative learning programs such as Supplemental Instruction (SI), Structured Learning Assistance (SLA), Emerging Scholars Program (ESP), Accelerated Learning Groups (ALGs), Video-based Supplemental Instruction (VSI), and Peer-led Team Learning (PLTL). These standards were developed through extensive field testing of professionals in the field operating these peer learning programs. There are four progressive levels of assessment and evaluation: program activity reports, immediate outcomes, short-term outcomes, and longer-term outcomes. The levels within each section are divided among questions to investigate, data needed for collection for analysis, and finally, analysis procedures. Depending on the particular peer learning program, some of these protocols would be more appropriate than others. A more detailed examination of mission, program design, administration, and other issues related to implementation of peer learning programs is provided elsewhere in the larger publication.

Arendale, D. R. (2014). *Annotated bibliography of postsecondary peer cooperative learning programs*. Unpublished manuscript. Department of Postsecondary Teaching and Learning, University of Minnesota. Minneapolis, MN. Retrieved from http://z.umn.edu/peerbib
This annotated bibliography contains all known citations regarding the following postsecondary peer collaborative learning programs: Accelerated Learning Groups, Emerging Scholars Program, Peer Assisted Learning Program, Structured Learning Assistance, Supplemental Instruction, and Video-based Supplemental Instruction. It has more than 1,100 entries in the following categories: dissertations and thesis papers; books, chapters, and monographs; journal articles; audio and videotapes; newsletter articles; ERIC documents; published conference proceedings; unpublished manuscripts; Internet resources; newspaper and magazine press coverage. In addition to the print version of the document, the web site provides a searchable online database that permits searching by a variety of criteria.

Baez, R., & Restro, W. (2002). *Is E.Q. a factor in the success of chem-2-chem Peer-Led Team Learning?* Conference Proceedings of the 223rd American Chemical Society National Meeting, Orlando, FL.
Peer-led Team Learning (PLTL) has been used at the University of Puerto Rico to support higher student achievement in introductory chemistry courses. A study was conducted with the PLTL program regarding the impact of the emotional quotient (E.Q.) as a determining part of why PLTL is successful.

Báez-Galib, R., Colón-Cruz, H., Resto, W., & Rubin, M. R. (2005). Chem-2-Chem: A One-to-One Supportive Learning Environment for Chemistry. *Journal of Chemical Education, 82*, 1859-1863.

Baker, G. A., Noether, D. L., Patterson, W. J., Ramstrom, O., Schiraldi, D. A., & Xiu, S. Z. (2000). The Workshop Project builds team savvy. *Chemical Innovation, 30*(12), 12.
This short article provides information about Peer-led Team Learning (PLTL).

Barker, L. J., & Cohoon, J. M. (2007). *Peer-led Team Learning: Retaining women through collaborative learning*. Boulder, CO: National Center for Women & Information Technology.
This short article describes how the Peer-led Team Learning (PLTL) program supports the persistence of women in the science curriculum. Female students involved in the Computing Alliance for Hispanic-Serving Institutions found that the learning environment that was enriched through PLTL was more supportive for both learning and persistence. The authors state that the collaborative learning activities must be carefully planned and facilitated to maximize the learning benefit for participating students.

Barlow, A., Dreyfuss, A. E., Sears, J., Bonhomme, A., Clarke, R., Moon, S., . . . Younge, L. (2012). *PLTL in the developmental writing classroom.* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY.

Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Barlow-2012.docx
Writing placement exam preparation can be broken down into small tasks overseen by Peer Leaders, following (though not precisely) patterns set out by Fred Keller in “Good-bye Teacher” in 1968. The mechanical aspect of writing, however, is never enough for the production of essays that communicate, something that requires audience and a desire to “speak.” Students in developmental classrooms often have problems beyond the writing itself: they may be test shy and may not be prepared to take on even college entry tasks without careful direction. Working with Peer Leaders, the developmental program can address the problems of mechanics and testing demands, the Peer Leaders taking on some of the responsibility for guiding students through the tasks.PLTLcan also help address the broader problems of preparation for college and even for critical thinking, the Peer Leaders serving as role models. The pilot program at New York City College of Technology (CUNY) was discussed.

Bartow, D. S. (2000). Peer-Led Team Learning in the community college. *Communitas, 11*, 3.

Bauer, C. F., Rickert, K. A., & Langdon, L. B. (2004). *Peer-Led Team Learning at the University of New Hampshire: Contrasts in student achievement, self-concept, attitudes, and implementations*. Paper presented at the Abstracts of Conference Papers for the 227th American Chemical Society National Meeting, Anaheim, CA.
Peer-led Team Learning (PLTL) was used in a general chemistry course at the University of New Hampshire since 2000. Data has been collected on students concerning what they learned, changes in self-concept attitudes, and social networks. Comparisons were made for student performance in a variety of instructional settings.

Becvar, J. E. (2004). *Two plus two equals more: Making room for Peer-led Learning*. Paper presented at the 227th American Chemical Society National Meeting, Anaheim, CA.
Peer-led Team Learning (PLTL) was used in a general chemistry course at the University of Texas at El Paso. Due to problems with extending the credit hours for the course to incorporate the required PLTL attendance, the number of hours in lecture each week were reduced from three to two.

Becvar, J. E., Valdez, M., & Aimeida, V. (2003). *Peer-led Team Learning: Explorations*. Paper presented at the 225th American Chemical Society National Meeting, New Orleans, LA.
The Peer-Led Team Learning (PLTL) program is used with the general chemistry courses for STEM majors at the University of Texas El Paso.

Berke, T. (2003). Peer-Led Team Learning: An active learning strategy that works: Good students become great student leaders. *Strategies for success, 39*(10), Article 1.
This short article provides an overview of the Peer-led Team Learning (PLTL) program. The author is professor of chemistry at Broodkale Community College.

Biggers, M., Yilmaz, T., & Sweat, M. . (2009). *Using collaborative, modified Peer Led Team Learning to improve student success and retention in intro computer science.* Conference Proceedings of the 40th ACM Technical Symposium on Computer Science, New York, NY.
It is common knowledge that enrollments in computer science have plummeted and educators are challenged to find ways to engage and promote success and retention of students while maintaining standards in introductory computer science courses. This study focuses on the implementation of a collaborative, modified peer-led team learning (PLTL) instructional approach in a large sized introductory computer science course. The site is a major southeastern university in the United States where all students are required to take one of three introductory computer science classes. The course version selected for this study specifically targets computer science majors and the study spans three years of data, and involves 591 students. Students who experienced the student-centered instruction and worked in small groups facilitated by a peer leader (treatment) in years 2006-07 and 2007-08 were compared with students who experienced a traditional recitation lecture section (control) in 2005-06. The content and the course owner was the same for all three years. Quantitative data analysis show marked and statistically significant improvements in student performance, for both male and female students. These findings suggest that using undergraduate leaders to implement a peer-led team learning model can be as effective in promoting achievement and retention in computer science education as it has shown to be in math and science classes over the past several years.

Black, A. E., & Deci, E. L. (2000). The effects of instructors' autonomy support and students' autonomous motivation on learning organic chemistry: A self-determination theory. *Science Education, 84*, 740-756.

Bonner, S. M., Keiler, L. S., & Mills, P. A. (2012). *PERC: A model for peer-facilitated learning in urban secondary school classrooms.* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Bonner-2012.docx
This report describes a research-based, peer-facilitated instructional approach that supports academic skill development among urban high school students. The Peer Enabled Restructured Classroom (PERC) is the product of a National Science Foundation (NSF)-funded partnership of high schools, higher education institutions, district administration, and school support organizations called the Math and Science Partnership in New York City 2 (MSPinNYC2). PERC places average-performing students in leadership roles in mathematics and science classrooms that have been restructured around learning teams. Development of academic competency in high school Science, Technology, Engineering, and Mathematics (STEM) disciplines is a prerequisite for college admission and success, and a national concern (Adelman, 2006; Porter, McMaken, Hwang, & Yang, 2011). Recent reports continue to demonstrate shallow conceptual understanding and applications of STEM content among k-12 students (National Center for Education Statistics, 2012). Essential objectives of the project are to improve mathematics and science performance among

historically under-performing groups, to raise graduation rates, and to increase the number of graduates ready to succeed in college. The five-year project is expected to reach nine (9) public high schools in the five boroughs of New York City (NYC) by 2015, which equates to approximately 12,000 students. This report describes the social context of our program, our model and its research base, and early evidence about outcomes.

Bradley, A. Z., Ulrich, S. M., Jones, M., & Jones, S. M. (2002). Teaching the sophomore organic course without a lecture. Are you crazy? *Journal of Chemical Education, 79*(4), 514-519.
An experimental approach to the sophomore organic course in which the lecture is almost completely replaced by small-group problem-solving sessions is described. Peer-led Team Learning (PLTL) was the program that was used in this approach. The course was monitored by a control group in the traditional lecture course taught by a traditional faculty member. The control group took exactly the same exams under exactly the same conditions as the 60-person experimental section. There was no significant difference in test scores--the experimental section did at least as well as the control. The students' evaluation of the experimental course was unusually positive. The small-group method appears to be a viable alternative to the traditional lecture-based course.

Brown, t. P., Becvar, J. E., Noveron, J. C., & Saupe, G. (2012). *No stupid questions.* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Brown-2012.docx
In general chemistry peer-led workshops at the University of Texas at El Paso, we place great emphasis on the establishment of mutual trust between students and the peer leader from the get-go. This generates a positive learning team where students develop a high degree of comfort and are not afraid to ask questions, even questions so basic as to be referred with the ugly expression 'stupid questions'. Workshops include hands-on, experimental activities called Explorations. These spark curiosity and lead to many questions. Students are generally not comfortable enough to ask questions in lecture; providing PLTL workshops directly addresses this issue. Comfort and trust in Workshop creates a learning environment where students are not afraid to ask questions of any type, where those student-led questions help eliminate the simple memorization of facts, and where students are able to think and act as problem-solvers to comprehend concepts.

Burke, K. A., Greehbowe, T. J., & Gelder, J. L. (2004). The multi-initiative dissemination project workshops: Who attends them and how effective are they? *Journal of Chemical Education, 81*(8), 897-902.
This article reviews several National Science Foundation dissemination grants, including Peer-Led Team Learning (PLTL) regarding their effectiveness in assisting other institutions to adopt transformative learning practices. The following areas were analyzed: participant demographics, training techniques, workshop goals, participant evaluations of the training workshops

Butcher, D. J., Brandt, P. F., & Norgaard, C. J. (2003). Sparking IntroChem: A student-oriented introductory chemistry course. *Journal of Chemical Education, 80*(2), 137-139.
At Western Carolina University (Cullowhee, North Carolina), the Peer-Led Team Learning (PLTL) approach was adopted for an introductory chemistry course to shift it from the traditional instructor-led model to a student-oriented model. PLTL was helpful not only for the students, but also the student instructors.

Caldwell, C. (2008). First-time feelings. Peer-Led Team Learning: The experience of leading. *Progressions: The Peer-Led Team Learning Project Newsletter, 10*(1). Retrieved from http://pltlis.org/wp-content/uploads/2012/10/Experience-of-Leading-Caldwell-First-Time-Feelings.pdf.
Firsts are special – a first rollercoaster ride... a first concert – and the reason these firsts are special is because the person experiencing that first thing, whatever it is, is super sensitive to that experience. She must be because she does not know what to expect so in order to react appropriately, she must be 'on her toes.' This higher state of awareness is valuable for the workshop leader

Cauthen, M. (2012). *How is the peer leader experience enhanced through a community of practice?* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Cauthen-2012.docx
Because of my experiences facilitating a math workshop this semester, I chose this question to explore how the skills needed to encourage team learning could be developed by using the ideas of Community of Practice theory regarding the social nature of learning, as a foundation to create a productive workshop experience for the students and the Peer Leaders.

Center for Peer-Led Team Learning. (2004). Training materials for PlTL leaders, Retrieved from http://www.sci.ccny.cuny.edu/~chemwksp/LeaderTrainingMaterials.html
This website provides training materials for Peer-led Team Learning leaders.

Cole, C. S., & Blake, B. (2003). *Peer-led Team Learning: The student leader's perspective.* Conference Proceedings of the 225th American Chemical Society National Meeting, New Orleans, LA. For more information, contact the author at the Department of Chemistry and Biochemistry, Texas Tech University, Lubbock, TX 79409, starcsc22@hotmail.com
The Peer-Led Team Learning (PLTL) program is used with the general chemistry courses at Texas Tech University beginning in Fall 2002.The intent of the program is to improve grades of participating students and provide leadership development for the student PLTL peer facilitators. Peer leaders write a weekly journal entry to describe their experience with the program. This paper reports on the impact with the student leaders.

Collins, R. (2009). Reflections of a reserved workshop leader. Peer-Led Team Learning: The experience of leading. *Progressions: The Peer-Led Team Learning Project Newsletter, 10*(2). Retrieved from http://pltlis.org/wp-

content/uploads/2012/10/Experience-of-Leading-Collins-Reflections-by-a-Reserved-Workshop-Leader.pdf.
The Workshop sessions helped me to interact with different kinds of students with various strengths, shortcomings and different attitudes, whom I wouldn't have generally come across due to my reserved nature. It was an opportunity for me to mix and mingle with all kinds of people, develop my interpersonal, leadership and communication skills. As time went by, I think I got be tter in explaining things to people and being more comfortable speaking in front of large groups of students. As time went by, I also got over the feeling that I was a minority Peer Leader with an accent that Americans students are not used to, and this boosted my confidence as a leader and consequently increased my comfort level with the students.

Cox, C. T. (2006). *An investigation of the effects of interventions on problem solving strategies and abilities.* (Ph.D. dissertation), Clemson University, Clemson, SC. Retrieved from http://gradworks.umi.com/32/17/3217983.htm
This dissertation investigated a number of intervention for improving student academic performance in science courses. One of the interventions considered was Peer-led Team Learning (PLTL). Results were mixed concerning its effectiveness with students. Complications of the analysis were caused by student choice regarding participation. The researcher speculated that PLTL worked with students who had lower academic preparation than the comparison student population. Problem-solving has been described as being the "heart" of the chemistry classroom, and students' development of problem-solving skills is essential for their success in chemistry. Despite the importance of problem-solving, there has been little research within the chemistry domain, largely because of the lack of tools to collect data for large populations. Problem-solving was assessed using a software package known as IMMEX (for Interactive Multimedia Exercises) which has an HTML tracking feature that allows for collection of problem-solving data in the background as students work the problems. The primary goal of this research was to develop methods (known as interventions) that could promote improvements in students' problem-solving and most notably aid in their transition from the novice to competent level. Three intervention techniques that were incorporated within the chemistry curricula: collaborative grouping (face-to-face and distance), concept mapping, and peer-led team learning. The face-to-face collaborative grouping intervention was designed to probe the factors affecting the quality of the group interaction. Students' logical reasoning abilities were measured using the Group Assessment of Logical Thinking (GALT) test which classifies students as formal, transitional, or concrete. These classifications essentially provide a basis for identifying scientific aptitude. These designations were used as the basis for forming collaborative groups of two students. The six possibilities (formal-formal, formal-transitional, etc.) were formed to determine how the group composition influences the gains in student abilities observed from collaborative grouping interventions. Students were given three assignments (an individual pre-collaborative, an individual post collaborative, and a collaborative assignment) each requiring them to work an IMMEX problem set. Similar gains in performance of 10% gains were observed for each group with two exceptions. The transitional students who were paired with concrete students had a 15% gain, and the concrete students paired with other concrete students had only a marginal gain. In

fact, there was no statistical difference in the pre-collaborative and post-collaborative student abilities for concrete-concrete groups. The distance collaborative intervention was completed using a new interface for the IMMEX software designed to mimic face-to-face collaboration. A stereochemistry problem set which had a solved rate of 28% prior to collaboration was chosen for incorporation into this distance collaboration study.

Cracolice, M. S. (2000). *Constructivist models for teaching chemistry: Applying Vygotsky's theories to Peer-led Team Learning.* Conference Proceedings of the 219st American Chemical Society National Meeting, San Francisco, CA. For more information, contact the author at the Department of Chemistry, University of Montana, Missoula, MT 59812, markc@selway.umt.edu
Peer-led Team Learning (PLTL) is used at the University of Montana in chemistry courses. This paper explores Vygotsky's constructivist theories as they relate to the effective operation of P:T:.

Cracolice, M. S., & Deming, J. C. (2001). Peer-Led Team Learning. *The Science Teacher, 68*(1), 20-25.
This article provides an overview of Peer-Led Team Learning (PLTL) program . The six components of PLTL are discussed. A model is provided for scheduling of classroom activities to allow for integration of the PLTL program activities. The three biggest challenges to implementing PLTL cited by the authors were: finding peer leaders, training the leaders, and selecting appropriate materials for the PLTL sessions. Recommendations are provided to overcome these challenges in providing an effective program. Data comparisons between PLTL and non-participants are provided for six institutions that have implemented the program.

Cracolice, M. S., & Deming, J. C. (2002). The Sky's the Limit: Learning through PLTL Teams at Big Sky High School. Peer-Led Team Learning: Implementation in high schools. *Progressions: The Peer-Led Team Learning Project Newsletter, 3*(2). Retrieved from http://pltlis.org/wp-content/uploads/2012/10/High-School-Implementation-Cracolice-Deming-The-Skys-the-Limit-Big-Sky-High-School.pdf.
Brett Taylor, a teacher at Big Sky High School in Missoula, Montana, was enthusiastic about hisinitial experience with a peer-led team learning workshop: “I was apprehensive at first, and as I walked around students kept coming to me for the answers,” he said. “I finally had to leave the room to get them to interact with their groups. When I returned, every student was ‘on task’ and engaged in the subject. In fact, every student stayed engaged for 50 to 60 minutes.” He could not believe how effective this method was at encouraging active learning and keeping students interested. High school peer leaders at Big Sky High School also believe that PLTL is an effective learning tool. When asked whether participating in PLTL affected how students solve problems, one leader answered, “PLTL forces them to learn on their own and not have the teacher hold their hand every step of the way. The students must come up with their own answers and work together to figure problems out. The groups helped build student confidence because I didn't have all the answers and so they had to rely on each other for help.”

Cracolice, M. S., & Deming, J. C. (2005). *Peer-led Team Learning: Promoting conceptual understanding and reasoning ability.* Conference Proceedings of the Trends and New Ideas in Chemical Education On-line Conference, On-line.
At the University of Montana (Missoula) the authors have successfully used Peer-led Team Learning (PLTL) in general chemistry courses. Six critical elements are identified for successful PLTL implementation: (1) integration of PLTL assignments with the total course. (2) involvement of the PLTL instructor to integrate the lecture, laboratory, and PLTL sessions. (3) PLTL leaders much be appropriately trained. (4) PLTL worksheets and learning materials must be challenging and designed for group work. (5) PLTL groups must be mandatory and meet two-hours weekly. (6)PLTL requires resources from the institution that continue after initial pilot testing and support by external funds.

Cracolice, M. S., Deming, J. C., Taylor, B., & Jones, D. (2001). *Adapting Peer-led Team Learning to high school chemistry.* Conference Proceedings of the 222nd American Chemical Society National Meeting, Chicago, IL. For more information, contact the authors at the Department of Chemistry, The University of Montana, 32 Campus Drive, Missoula, MT 59812, markc@selway.ymt.edu
Peer-led Team Learning (PLTL) has been used at institutions to support higher student achievement in chemistry courses. It has ben adapted for use at the high school level by heavy emphasis on interpreting experimental data.

Darnell, A., Becvar, J., Flores, B., Knaust, H., Lopez, J., & Tinajero, J. (2012). *Achieving student success using Peer-Led Team Learning (PLTL).* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Darnell-2012.docx
This paper presents the results of a five year implementation of peer-led team learning at the University of Texas at El Paso (UTEP) in five freshmen and sophomore chemistry, physics, and mathematics courses. The intervention was designed to improve retention and success of these students in their undergraduate program. The imperative for this work, to fulfill the University of Texas at El Paso's mission of "access and excellence," provided a new option to the traditional large-lecture course of yesteryear. Students indicated they learned more in their small group workshops than by any other modality offered.

Detchen, J. C., Hershberger, S. A. S., & Sarquis, J. L. (2004). *PLTL research explorations at Miami University.* Conference Proceedings of the 227th American Chemical Society National Meeting, Anaheim, CA. For more information, contact the authors at the Department of Chemistry and Biochemistry, Miami University, 501 E. High Street, Oxford, OH 45056, detchenc@muohio.edu
Peer-led Team Learning (PLTL) was used in a general chemistry course at Miami University (OH). PLTL was first used in 1998. A research study compared the impact of PLTL and Supplemental Instruction on different sections of the same course. All students in the different sections took the same ACS Examinations Institute exam as a final exam and each section was administered the Group Assessment of Logical

Thinking instrument (GALT), and were surveyed using the Student Assessment of Learning Gains (SALG) instrument.

Diegelman-Parente, A. (2012). *The scholarship of Peer-led Team Learning: My progression from student leader to faculty.* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Parente-2012.docx
Twenty years ago, I was an undergraduate majoring in Biology and Chemistry, struggling with the desire to integrate the details I had learned in my Chemistry courses with the 'big picture' philosophy stressed in my Biology curriculum. These early educational experiences fostered my passion for curricula geared towards interdisciplinary learning and in programs designed to increase awareness of alternative learning styles and pedagogies for instruction. My Workshop journey began shortly thereafter with PLTL's inception at the University of Rochester. Now as a faculty member, I have implemented PLTL and two other pedagogies into my General Chemistry, Organic Chemistry, and Biochemistry curricula with a "full-circle" perspective that has been nearly two decades in the making. This article will examine the evolution of my educational philosophy as I progressed from student leader to faculty as well as some strategies I have found useful for its implementation and means to involve these alternative pedagogies in my scholarly activities for promotion and tenure.

Dill, D. (2004). *Implementing PLTL in the quantum concepts semester of physical chemistry.* Conference Proceedings of the 227th American Chemical Society National Meeting, Anaheim, CA. Retrieved from http://quantumconcepts.bu.edu/dissem/PLTLInPhysicalChemistry.pdf For more information, contact the author at the Department of Chemistry, Boston University, 590 Commonwealth Avenue, Boston, MA 02215, dan@bu.edu
Peer-led Team Learning (PLTL) has been implemented in a physical chemistry course at Boston University, The professor found that the allocation of time for course preparation, student discourse, the use of regular class time, and student performance have all changed from prior years. From the students' point of view, they have the opportunity and responsibility to work with methods and explore concepts more deeply. The course professor identified four primary effects. First, the creation and then revision of the workshops based on input from the peer leaders takes significant time. Second, interaction in lecture is more sophisticated and students are more likely to steer lectures in interesting, unanticipated directions. Third, PLTL has provided a good balance of challenge and accessibility. Finally, PLTL has helped solidify for students foundation quantum concepts and so allowed the course instructor to present material at a richer level. http://quantum.bu.edu/courses/ch352/workshops.html.

Dominguez, N., Salazar, J., Narayan, M., & Becvar, J. E. (2012). *Peer leading helps more than the students being led.* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Dominguez-2012.docx
Workshops help the peer leaders learn the content in their own STEM majors' courses by enhancing the understanding of the basic concepts taught in introductory science

courses. Because each peer leader teaches at least two 2-hour workshops a week and spends a minimum of three hours preparing for those workshops, the leaders have a more in-depth understanding and command of the basic principles. Because of this better grounding in the discipline, the peer leaders have an advantage when it comes to taking standardized entrance exams for higher education such as MCAT, GRE, PCAT, and DAT. In addition, peer leaders have the further advantage that Workshops force them to continue to review the material for years after taking the course. Peer leaders improve leadership and communication skills; skills they will continue to use throughout their lifetimes in whatever career they pursue.

Drane, D., Micari, M., & Light, G. (2012). *Students as teachers: Effectiveness of a Peer-Led STEM Learning Program over 10 years*. Unpublished manuscript. Northwestern University. Chicago, IL. Retrieved from www.northwestern.edu/searle/PDF/studentsasteachers.pdf
Peer-led small group learning has been used quite extensively in the US as a strategy to enhance performance and retention of undergraduate students in science, math and engineering classes. This study presents the results from an evaluation of a peer-led small group program at a selective research university in the US over a 10 year period across five disciplines (biology, chemistry, engineering, physics and math) and seven courses. Data suggest that the program had a positive impact on participants' grades in 5 of the 7 courses and on participant retention in the 4 courses that require students to take a consecutive course sequence. Effects of the program were investigated across gender and ethnic groups. Participants benefited from the program regardless of their gender or ethnicity. However, effect sizes were often larger for students from under-represented groups. This was particularly true in the case of course retention where effect sizes for females were larger than those for males in biology, organic chemistry and engineering courses.

Drane, D., Smith, H. D., Light, G., Pinto, L., & Swarat, S. (2005). The Gateway Science Workshop Program: Enhancing student performance and retention in the sciences through peer-facilitated discussion. *Journal of Science Education and Technology, 14*(1), 337-353.
This article describes an adaptation of the Emerging Scholars Program (ESP) called the Gateway Science Workshop (GSW) Project used at Northwestern University in Evanston, IL. The GSW Project was analyzed regarding its effectiveness of increasing academic performance and retention in biology, chemistry and physics courses at a selective research institution. GSW participants earned higher final grades and persistence rates than nonparticipants in biology and chemistry, but not in physics. The researchers discuss the factors favoring and challenging effectiveness of GSW in each of the three academic content areas. The results are analyzed and disaggregate on the basis of ethnicity as well. The benefits of GSW are especially helpful to students of color for whom the program has a major emphasis. However, the evaluation study found usefulness for students of a wide range of demographic backgrounds.

Dreyfus, A. E. E. (n.d.). Internet Homepage of the Peer-Led Team Learning Program [On-Line].Retrieved from http://www.pltl.org and http://www.sci.ccny.cuny.edu/~chemwksp/index.html
This is the internet web page for the Peer-Led Team Learning (PLTL) Program originally developed at the City University of New York in the mid 1990s. Information and materials available through this website include: program overview, research studies, workshop training and conference schedule, available materials to purchase, grant program to assist with PLTL implementation, PLTL newsletter, calendar of upcoming events, contact information for PLTL program staff and persons from adopting institutions across the U.S., and other information resources. PLTL has been funded by the National Science Foundation to support its national dissemination.

Dreyfuss, A. E. (2012). *Exploring the phenomenon of leading through the experiences of peer leaders.* (Ed. D. dissertation), Columbia University, New York City, NY.
The concept of leadership has been explored in many contexts, yet it is not a role that is expected as part of a college education. Peer Leaders are in a unique position because they are responsible for leading a group of students to learn. This phenomenological case study explored the experience of leading by Peer Leaders, college students who are selected and trained in adult learning theory to lead a group of students to learn the course material in an introductory science course, in a Peer-Led Team Learning program at an urban commuter public college. Seventeen of the 22 study participants served more than one semester, averaging four, over the past ten years. In-depth interviews were conducted and three emergent metaphors were identified. These are the "Older Sibling," a role based in prior learning of family with informal authority; the "Faces of the Mountain," a more traditional view of leadership combining positional authority and entity attributes; and the "Catalyst" who manages several small groups of learners, giving power back to the group members. The essence of leading by Peer Leaders is proposed as the following: Leading a workshop group is drawn from prior experience, perhaps a familial role of a sibling, or tacit assumptions and expectations of the role of a leader. It has a cognitive foundation in the task of helping students learn course material yet it is in the dynamics of interacting with the students that a relational process occurs. Emergent relational leadership roles are based in communication, discourse, emotions, diversity of learners' needs and abilities. It is through this experiential process that leading becomes a catalytic activity whereby the leader manages smaller groups to enable each group member to help others learn. Relational leadership is inclusive, challenging, and carries with it the burden of responsibilities to fellow students, fellow Peer Leaders, faculty, and the department. It can also be fun, and may flow with energy, and most importantly, it can be transformational in the ways the Peer Leader views being a follower, learning and leadership.

Dreyfuss, A. E. (2012). *A history of Peer-Led Team Learning: 1999-2012.* Conference Proceedings of the Inaugural Conference of the Peer-Led Team Learning International Society, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/Dreyfuss-History-of-PLTL-2012-rev.docx

This conference paper provides a comphrehensive history of the development and dissemination of the Peer-Led Team Learning model for academic support of students in science and mathematics courses.

Dreyfuss, A. E., & Gosser, D. K. (2006). In their own words: Learning to be a peer leader. In D. B. Lundell, J. L. Higbee, I. M. Duranczyk & E. Goff (Eds.), *Student standpoints about access programs in higher education* (pp. 143-157). Minneapolis, MN: Center for Research on Developmental Education and Urban Literacy, College of Education and Human Development, University of Minnesota-Twin Cities.Retrieved from http://www.education.umn.edu/CRDEUL/monographs.html.
This chapter focuses on the experience of the student facilitators who serve in the Peer-led Team Learning (PLTL) program. The beginning of this chapter provided an overview of the PLTL program. Then the narrative focused on the training program for the student facilitators. As a continuation of the initial training, all facilitators maintain a weekly log for them to reflect upon the growth of the students as well as their own personal and professional development. Analysis of the journals identified nearly ten themes that dominated the conversation of the participating students and the inner minds of the facilitators.

Flintoff, N. L., Shoop, K., Sommers, B., Wittwer, J., & Cavinato, A. G. (2001). *Peer-led Team Learning: Active learning strategies to support success in introductory chemistry courses.* Conference Proceedings of the 221st American Chemical Society National Meeting, San Diego, CA. For more information, contact the authors at the Department of Chemistry, Eastern Oregon University, One University Boulevard, La Grande, OR 97850, flinton@eon.edu
Peer-led Team Learning (PLTL) is used at Eastern Oregon University in chemistry courses. PLTL is offered as a separate one credit pass/no pass course. Studies regarding student achievement have been conducted.

Fortier, A. S. (2009). Peer-Led Team Learning and teaching high school – a letter. Peer-Led Team Learning: Implementation in high school. *Progressions: The Peer-Led Team Learning Project Newsletter, 10*(2). Retrieved from http://pltlis.org/wp-content/uploads/2012/10/High-School-Implementation-Fortier-PLTL-and-Teaching-in-HS.pdf.
I spent the past year as a Grade 9 IPC (Integrated Physics & Chemistry) and Grade 11 Chemistry teacher at an El Paso, Texas, high school. After graduating from college, I thought it would be fun and exciting to teach high school science before going on to pursue my graduate studies. Unfortunately, I found the job to be much more challenging than I initially thought. If it had not been for my experience as an undergraduate Peer Leader, I would not have been ableto make it through the school year. Considering that my degree is in Chemistry and not Education, I chose to get my probationary teaching certificate through Texas Alternative Certification Process (ACP). I needed a fast track option to getting a probationary license and the only true requirements at Texas ACP is that you have the appropriate college credits and enough money to pay the fees. The program is also very flexible about attending their night classes so long as these are completed with in one year of entrance to the program.

Frank Wang, A. T., Joyce Zaritsky. (2012). *Academic Peer Instruction (API) Program for remedial algebra at LaGuardia Community College.* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Wang-2012.docx
In 2011 and 2012, LaGuardia Community College, City University of New York, conducted a large-scale study by deploying highly selective Academic Peer Instruction (API) tutors in about 20 remedial algebra sections to promote collaborative learning and effective use of technology. The research hypothesis was that API tutors would motivate students to spend more time on studying, utilizing the online learning system called "EDUCO," which in turn would improve their academic performance. We present evidence that the students in the API group consistently show better outcomes in course pass rates and mean exam scores with lower standard deviations, compared to the students in the control group. We also share results of faculty and student surveys, reflecting the promise and challenge of peer instruction.

Freyvogel, C. (2006, 2006, February 1). Model students: Area teacher sold on team-learning process, *The Tribune-Democrat*. Retrieved from http://www.tribune-democrat.com/features/local_story_032154327.html.
Ray Trybus, a science teacher at Portage Area High School, uses Peer-Led Team Learning (PLTL) with his high school students. The article provides interviews with the teacher as well as some of the high school students.

Gafney, L. (2002). PLTL and secondary school teaching, Peer-Led Team Learning: leader training. *Progressions: The Peer-Led Team Learning Project Newsletter, 3*(2). Retrieved from http://pltlis.org/wp-content/uploads/2012/10/High-School-Implementation-Gafney-PLTL-and-Secondary-School-Teaching.pdf.
This report is an excerpt from a telephone interview conducted by Leo Gafney as part of the study of former peer leaders at St. Xavier University in Chicago. It provides a dramatic illustration of how the peer leader experience inspired Yvonne O'Connell in her work as a secondary school teacher at a private school for boys.

Gafney, L. (2004). Peer leader and Rhodes Scholar: Peer-led Team Learning, The experience of learning. *Progressions: The Peer-Led Team Learning Project Newsletter, 5*(3). Retrieved from http://pltlis.org/wp-content/uploads/2012/10/Experience-of-Leading-Gafney-Peer-Leader-Rhodes-Scholar.pdf.
Rick Malins, a senior at Boston University, was awarded a Rhodes Scholarship and will study for a doctoral degree in neuroscience at Oxford University. He was a workshop leader for two different courses at Boston University. The following is based on a phone interview with him, conducted by Leo Gafney in January 2004

Gafney, L., & Varma-Nelson, P. (2003). *Impact of being a peer-leader on undergraduate students.* Conference Proceedings of the 226th American Chemical Society National Meeting, New York, NY. For more information, contact the author at the PLTL

Workshop Project, 147 Wells Hill Road, Lakeville, CT 06039, gafney@pop3.discovernet.net
The Peer-Led Team Learning (PLTL) is dependent upon the student peer facilitators who conduct the sessions. A survey of the effects of serving as a peer leader regarding personal mastery of chemistry concepts, impact on career and graduate education options, and interpersonal skill development.

Gafney, L., & Varma-Nelson, P. (2007). Evaluating Peer-Led Team Learning: A study of long-term effects on former workshop peer leaders. *Journal of Chemical Education, 84*(3), 535-539. Retrieved from http://pubs.acs.org/doi/pdf/10.1021/ed084p535.
This article describes a study that examined the impact of the Peer-led team learning (PLTL) program with the student facilitators who had direct contact with the students. With a decade of data available on 600 student leaders from 9 institutions, the PLTL facilitators were studied as they took subsequent steps into graduate work and careers. A survey was developed, piloted, revised, and placed online. There were 119 leaders who completed the survey. Respondents reported that leading the workshops reinforced the breadth and depth of their own learning, helped them develop personal qualities such as confidence and perseverance, and fostered a variety of presentation and team-related skills. The respondents offered rich insights into issues in implementing workshops.

Garmon, L. (2012). *Why attendance is mandatory in workshops: Comparison of course grades of workshop attendees vs. non-attendees with similar GPA and SAT ccores.* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Garmon-2012.docx
Records of test scores and course grades going back over ten years are available for approximately 5400 students in first-semester general chemistry and 3300 students in second-semester general chemistry at the University of West Georgia. In this project those attending workshops regularly throughout a semester were matched in GPA (prior to taking general chemistry) and SAT scores with those not attending regularly. Most students were enrolled in sections in which workshop attendance was an integral part of the course. Those not attending fell into three categories: those in sections that included workshop but who chose not to attend and thus not to meet that requirement; those who were enrolled in an honors section, which did not include workshops; and those taking the course online, as the sections offered online have up to now not included workshops. In all cases, those with similar GPA/SAT scores who attended workshop outperformed those who did not.

Ghezzi, L., Ahmed, M., Cauthen, M., Chan, C., Hendricks, T., & Tran, T. (2012). *A peer-led workshop experience in an introductory mathematics class* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Ghezzi-2012.docx

In this paper the Instructor and the Peer Leaders share their experience with the Peer-Led Workshop embedded in an introductory Mathematics class at the New York City College of Technology in the spring 2012 semester.

Gilmore, J. G. (2010). PLTL impacts a career - from peer leader to the professoriate. Peer-led Team Learning: The experience of leading. *Progressions: The Peer-Led Team Learning Project Newsletter, 12*(1). Retrieved from http://pltlis.org/wp-content/uploads/2012/10/Experience-of-Leading-Gilmore-PLTL-Impacts-a-Career.pdf.
In August of 1998, the author arrived at the University of Rochester fresh from a five-year BS/MS at Virginia Tech. That fifth year to complete a master’s thesis convinced the student of desire to be a physical organic chemist, and consider an academic career rather than the original pharmaceutical industry trajectory. At Rochester she joined Joe Dinnocenzo's group to study photoinduced charge transfer initiated cation radical reactions in polymeric media, and realized she would not teach for at least a semester or two. The experience as a Peer Led Team Learning (PLTl) facilitator solidifed resolve to become a teacher.

Glenn, K. (1998). General chemistry teaching workshop: A student's view. *Journal of Chemical Education, 75*(2), 147-150.
This article focuses on the reaction of the student facilitators who work in the Peer-led Team Learning (PLTL) program. Interviews with seven students from Saint Xavier University, Chicago, IL; The City College of CUNY; University of Kentucky; University of Montana; American University, and University of Rochester.

Goodwin, J. A., & Barrett, J. (2002). *Electronic workshops: Development of computer-based activities for Peer-led Team Learning in general chemistry.* Conference Proceedings of the 224th American Chemical Society National Meeting, Boston, MA. For more information, contact the author at the Department of Chemistry and Physics, Coastal Carolina University, P.O. Box 261952, Conway, SC 29528, jgoodwin@coastal.edu
Peer-led Team Learning (PLTL) has been used at the Coastal Carolina University (SC) to support higher student achievement in introductory science courses. PLTL is supplemented with hybrid print and computer-based study materials. The program has been assessed through surveys, pre- and post-testing, and focus groups.

Goodwin, J. A., & Gilbert, B. D. (2001). Cafeteria-style grading in general chemistry. *Journal of Chemical Education, 78*(4), 490-493.
Self-selected individual course-grade weighting schemes allow students personal choice of course components in the general chemistry sequence at Coastal Carolina University. With the availability of a wide range of commercial and academically produced pedagogical resources, students can select materials that best suit their own learning styles, social situations, and motivation level. Our students use a signed contract to indicate their preferred grade-weighting schemes for determination of the course grade. In doing so, they choose from course components that include peer-led team learning (PLTL) in the Workshop Chemistry (WSC) model, computer-assisted instruction (CAI) using the ChemSkill Builder (CSB) software, a variety of in-class

quizzes and group problem-solving exercises, written exams, and the final written exam. Minimum percentage values are required of all components except WSC and CSB, which have been completely optional graded course components at CCU since the summer of 1999. Comparison of student success in the course and content learning suggests that the improvements observed with introduction of a gamut of activities increase even more when the cafeteria-style grading is implemented.

Goroff, N. S. (1998). Report on "workshop chemistry". *The Chemical Educator, 3*(1), online article.
David Gosser (City College of New York) and Pratibha Varma-Nelson (St. Xavier University, Chicago) presented the Workshop Chemistry initiative, "a coalition of faculty, students, and learning specialists organized around a peer-led, team-learning model of teaching chemistry." Through presentations and small group discussions with undergraduates, participants learned about this program, how it has been implemented at two different schools, and how it might fit into their own curriculum.

Gosser, D., Dreyfuss, A. E., & Gafney, L. (Eds.),. (2006). Progressions: Peer-led Team Learning Newsletter, Retrieved from http://pltl.org
This online newsletter provides an overview, implementation and research studies, and other resources related to Peer-led Team Learning (PLTL).

Gosser, D. K. (1997). *The workshop chemistry project: Developing a Peer-led Team Learning model for chemistry instructors.* Conference Proceedings of the 213th American Chemical Society National Meeting, San Francisco, CA. For more information, contact the author at the Chemistry Department, The City College of New York, 138th Street and Covent Ave., New York, NY 10031, gosser@sci.ccny.cuny.edu
Peer-led Team Learning (PLTL) was used with undergraduate chemistry students at the City College of New York.

Gosser, D. K. (2003). *Dynamics of peer-assisted active learning*. Paper presented at the 226th American Chemical Society National Meeting, New York, NY. For more information, contact the author at the Chemistry Department, The City College of New York, 138th Street and Convent Ave., New York, NY 10031, gosser@sci.ccny.cuny.edu.
Peer-Led Team Learning (PLTL) was used with introductory chemistry courses of the City College of New York. Data from the national study of PLTL as well as recommendations for successful implementation of the program are provided.

Gosser, D. K. (2004). *Peer-led Team Learning: Development, dissemination, and research*. Paper presented at the 228th American Chemical Society National Meeting, Philadelphia, PA. For more information, contact the author at the Chemistry Department, The City College of New York, 138th Street and Covent Ave., New York, NY 10031, gosser@sci.ccny.cuny.edu.
Peer-led Team Learning (PLTL) was used with undergraduate chemistry students at the City College of New York. The paper focused on the origins of PLTL, national dissemination of the program, and research studies on PLTL.

Gosser, D. K. (2006). PLTL in general chemistry: Scientific learning and discovery. In N. Pienta, M. Cooper & T. Greenbowe (Eds.), *The chemists' guide to effective teaching, volume 2*. Upper Saddle River, NJ:: Prentice Hall

Gosser, D. K., Cracolice, M. S., Kampmeier, J. A., Roth, V., Strozak, V. S., & Varma-Nelson, P. (Eds.). (2001). *Peer-Led Team Learning: A guidebook*. Upper Saddle River, NJ: Prentice Hall
This book provides strategies for implementing the Peer-Led Team Learning (PLTL) program by other educators. This book explains the theory behind PLTL, offers suggestions for successful implementation(including how to write effective group problems and how to train peer leaders), discusses how to evaluate the success of the program, and answers to frequently asked questions.

Gosser, D. K., Cracolice, M. S., & Strozak, V. S. (Eds.). (2005). *Peer-Led Team Learning, the workshop project: General chemistry*. (2nd ed.). Upper Saddle River, NJ: Prentice Hall
This book provides strategies for implementing the Peer-Led Team Learning (PLTL) program by other educators in a general chemistry course. Each of the 24 units in the consumable workbook addresses a significant topic in chemistry by providing a short narrative summary, structured small-group learning activities, discussion questions, and self-test activities to monitor comprehension of the material.

Gosser, D. K., & Mar, V. (2003). *Peer-Led Team Learning: An introduction*. Unpublished manuscript. City University of New York. New York, NY. Retrieved from http://www.pltl.org
This article provides an overview of the Peer-Led Team Learning (PLTL) program developed at the City University of New York. PLTL has been implemented at more than 100 institutions that seek to improve student achievement in science courses.

Gosser, D. K., & Roth, V. (1998). The workshop chemistry project: Peer-Led Team Learning. *Journal of Chemical Education, 75*(2), 185-187.
This article provides an overview of Peer-Led Team Learning (PLTL) program . The program is supported through the National Science Foundation, Division of Undergraduate Education, Course and Curriculum Development Program, part 1. The project involves a new curriculum structure, a two-hour student-led workshop with six to eight students to replace the traditional recitation or a modest amount of lecture.

Gosser, D. K., Roth, V., Gafney, L., Kampmeier, J., Strozak, V., & Varma-Nelson, P. (1996). Workshop chemistry: Overcoming the barriers to student success. *The Chemical Educator Online, 1*(1), Article 1. Retrieved from http://chemeducator.org/bibs/0001001/00010002.htm.
This article provides an overview of Peer-led Team Learning (PLTL) as it is used in chemistry. A qualitative research study was conducted with PLTL sponsoring faculty members, PLTL student leaders, and PLTL participants. The results suggest positive gains in motivation and science knowledge by the participants. The PLTL leaders

reported gains in communication and leadership skills. Sponsoring faculty members reported high satisfaction with the program since it improved scientific learning.

Gosser, D. K., Strozak, V., & Cracolice, M. (Eds.). (2001). *Peer-led Team Learning: General chemistry*. Upper Saddle River, NJ: Prentice Hall

Gosser, D. K., Strozak, V., & Cracolice, M. (Eds.). (2006). *Peer-led Team Learning: General chemistry* (2nd ed.). Upper Saddle River, NJ: Prentice Hall

Guzman, J., Becvar, J. E., & Saupe, G. (2012). *Workshop adaptability.* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Guzman-2012.docx
How often would a student in a course walk up to a professor and say: “Professor, I do not comprehend the material; would you mind changing your teaching style?” More than likely one would never see this scenario. Students generally are forced to adapt to their professor, not the other way around. At the University of Texas at El Paso the Peer-Led Team Learning program provides the ability to tailor a classroom to the students’ needs. The peer leader directs students into self-learning using team-based activities and problem solving strategies. One advantage of this program is its ability to evolve to students’ needs. The small classroom environment promotes a personal connection among peers. This personal connection allows students to feel comfortable to ask questions and even more important, to make suggestions. The format allows students to reflect on the activities for the day to make recommendations for following workshops and for improvements giving students a sense of ownership of their learning process. The relaxed learning environment focuses attention on learning the concepts at hand not the shortcomings of the professor.

Han, S., Mejia, J., Bonhomme, A., Plaku, A., & Tavera, G. (2012). *This is not just tutoring.* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Han-2012.docx
MAT1175, the first credit-level math course at City Tech, covers topics in algebra and geometry. Many students at this level display a lack of skill and motivation. The embedded peer-led workshop provides a strong support to help students succeed. Led by trained peer leaders, students work diligently and collaboratively on new math concepts as well as fundamental skills. Faculty instructor and peer leaders integrate different techniques and creative ideas to cultivate a supportive environment and stimulate learning. The peer leaders and students share some of their favorite activities and reflections in this paper.

Hersam, M. C., Luna, M., & Light, G. (2004). Implementaiton of interdisciplinary group learning and peer assessment in a nanotechnology engineering course. *Journal of Engineering Education, 93*(1), 49-57.
Nanotechnology is an inherently interdisciplinary field that has generated significant scientific and engineering interest in recent years. In an effort to convey the excitement

and opportunities surrounding this discipline to senior undergraduate students and junior graduate students, a nanotechnology engineering course has been developed in the Department of Materials Science and Engineering at Northwestern University over the past two years. This is part of the University[s Gateways Science Workshops program. This paper examines the unique challenges facing educators in this dynamic, emerging field and describes an approach for the design of a nanotechnology engineering course employing the non-traditional pedagogical practices of collaborative group learning, interdisciplinary learning, problem-based learning, and peer assessment. Utilizing the same nanotechnology course given the year before as a historical control, analysis of the difference between measures of student performance and student experience over the two years indicates that these practices are successful and provide an educationally informed template for other newly developed engineering courses.

Hewlet, J. A. (2005). In search of synergy. *Journal of College Science Teaching, 33*(4), 28-31.
Peer-led Team Learning (PLTL) is used at Finger Lakes Community College in Canandagua, NY to improve student performance. An innovation was the merging of the Case Study Method (CSM) with PLTL which served as the learning environment in which to engage and interact with the rigorous academic content material. Participating students earned a higher percentage of C or higher grades (87%) vs. the nonparticipants (78%).

Hockings, S. C., DeAngelis, K. J., & Frey, R. F. (2008). Peer-led Team Learning in general chemistry: Implementation and evaluation. *Journal of Chemical Education, 85*(7), 990-996.
This article describes the use of Peer-led Team Learning (PLTL) in general chemistry. This PLTL program at Washington University in St. Louis, unlike the national model, permits students to choose participation in the sessions for the academic term. However, once they declare intent, they must attend all weekly sessions. Regression analysis of the comparisons between PLTL and nonPLTL participants found statistical significance in reduction of course withdrawals (1.3% vs. 4.4%), final course grade below B- (33.6% vs. 42.8%) and final course grade (2.94, B average vs. 2.74, B- average). PLTL reported improved attitudes towards chemistry improved as a result of their experience with the weekly sessions. This study confirmed that optional participation in PLTL did not diminish its impact with students.

Hoffelder, A. M., & Hoffelder, R. L. (2003). *Evaluation of the Peer-led Learning (PLTL) approach to General Chemistry, CHM 137 for Fall Semester, 2002*. Unpublished manuscript. Miami University. Oxford, OH. Retrieved from http://www.terrificscience.org/about/pdfs/PeerLedLearning.pdf
This report provides a detailed examination of the impact of Peer-led Team Learning in a chemistry course at Miami University (OH). The 65-page report carefully compares the performance of the students in the course with PLTL support and another course that did not have the support. The students enrolled in the PLTL-supported course were slightly less prepared academically than the other course. All the students were studied

regarding final course grades and performance in the next course in the academic sequence. In addition, interviews and surveys were conducted with the students in the PLTL-supported course. The PLTL students slightly outperformed their counterparts but not to the degree of statistically-significance. Considering that they began slightly behind, the researchers theorize that this could be considered a minor success. The qualitative interviews with the PLTL students revealed a strong belief that the program supported their academic success in the course and reinforced their persistence in the science degree program.

Hoffelder, A. M., & Hoffelder, R. L. (2003). *A gender comparison of academic preparation and general chemistry success as seen in two approaches to instruction during Fall semester, 2002 at Miami University*. Unpublished manuscript. Miami University. Oxford, OH. Retrieved from http://www.terrificscience.org/about/pdfs/gender.pdf
The purpose of this study was to determine if there is a gender difference in general chemistry success as a result of the Peer-Led Team Learning (PLTL) approach to instruction in general chemistry. The CHM 137 females (PLTL participants) as a group had lower preparation values and a higher relationship between that preparation and the success variables, yet they did better (had higher scores) on both of the success variables. These students were compared with other female students enrolled in a separate section of chemistry which did not offer PLTL support. From the larger study of the PLTL program there is evidence of personal and emotional importance to the participants in the PLTL approach of CHM 137.

Hoffman, M. Z., & Crosby, A. D. (2003). *Getting general chemistry students to read, write, and speak.* Conference Proceedings of the 225th American Chemical Society National Meeting, New Orleans, LA.
Peer-led Team Learning (PLTL) is part of a program to increase the competency of honors-level general chemistry students at Boston University. The sessions provide an environment for students to critically discuss and analyze chemistry concepts.

Hoffman, M. Z., & Crosby, A. D. (2004). *Assessing Peer-led Team Learning in honors-level general chemistry.* Conference Proceedings of the 228th American Chemical Society National Meeting, Philadelphia, PA. For more information, contact the authors at the Department of Chemistry, Boston University, 590 Commonwealth Avenue, Boston, MA 02215, hoffman@chem.bu.edu
Peer-led Team Learning (PLTL) was used in an honors college at Boston University. Students provided feedback about PLTL through frequent survey forms and writing assignments. Students reported that the PLTL peer facilitators were more effective than traditional graduate assistants in learning the chemistry content material. Additional reported benefits included higher self confidence and deeper understanding of the role of a teacher.

Hogan, P., Parks, C. X., & Ciotti, A. (2004). *Early intervention with peer-led study groups for organic chemistry.* Conference Proceedings of the 227th American Chemical

Society National Meeting, Anaheim, CA. For more information, contact the authors at the Department of Chemistry, Suffolk University, 41 Temple Street, Boston, MA 02114
Peer-led Team Learning (PLTL) was used in an organic chemistry course at Suffolk University (MA). Surveys of students suggest improvements in understanding of difficult course material.

Holladay, S. R. H. (2004). *Analysis of PLTL leaders' reflections.* Conference Proceedings of the 227th American Chemical Society National Meeting, Anaheim, CA. For more information, contact the author at the Department of Chemistry, Indiana University Purdue University Indianapolis, 402 N. Blackford St., Indianapolis, IN 46202, holladay@chem.lupui.edu
Peer-led Team Learning (PLTL) was used in a general chemistry course at Indiana University Purdue University Indianapolis. Data was collected from the student peer PLTL leaders through journal entries. The entries included responses to open-ended questions about group dynamics and other questions that allowed the student leaders to reflect about their experience. The study revealed changes in them due to the experience.

Hong, N. K., Ford, A., Nguyen, T., & Huynh, P. (2012). *San Jose City College peer leaders share their expertise in leading and evaluating effective PLTL workshops.* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Hong-2012.docx
The PLTL program at San Jose City College has transformed the culture, resulting significant gains in student success and retention. Indeed, the culture has revitalized the students in the chemistry department as demonstrated by their positive and enthusiastic attitude toward chemistry and instructors. Peer leaders from San Jose City College discussed the implementation components of the PLTL program, including peer-to-peer assessment, evaluation, as well as strategies for implementing a variety of pedagogies. We also summarized program assessment data and shared highlights of weekly leader meetings as well as our spring 2012 semester two-day orientation workshops.

Hooker, D. D. (2010). *A study of the effects of the implementation of small peer led collaborative group learning on students in developmental mathematics courses at a trivial community college.* (Ph.D. dissertation), Montana State University, Bozeman, Montana. Retrieved from http://etd.lib.montana.edu/etd/2010/hooker/HookerD0510.pdf
College students needing remediation in mathematics are a problem at nearly all colleges and universities but are immense at community colleges where large numbers of students enroll in developmental mathematics courses. This issue for Native American students at Tribal Community Colleges has an enormous effect on future opportunities in education, employment, politics and society. The overarching research question was: How does the implementation of small peer-led collaborative learning groups affect students in developmental mathematics courses at the Tribal Community College? This study focused on an application of Peer-Led Team Learning (PLTL). To answer this question five sub-questions were addressed. What impact will the treatment

have on: 1) completion, 2) perseverance, 3) demonstrated procedures of mathematics, 3) personal skills for success, and 4) the leaders' perceptions of the benefits associated with acting as small peer led collaborative group leader This research study took place at a small Tribal Community College. The quasi experimental, mixed methods study involved collection and analysis of both quantitative and qualitative data. The treatment class consisted of having the students work together on a workshop activity designed to be engaging, challenging and relevant for one class period each week in small peer-led collaborative learning groups. Peer leaders were chosen according to predetermined criteria. The peer leaders were trained to help guide the group in the direction of a solution and to help the group learn how to collaborate to achieve the best results. The control class was given the same workshop activity to work on, but not encouraged to work together nor assisted by a peer leader. Results of this research study show increased completion and perseverance rates. Students participating in the small peer-led collaborative groups were more likely to attempt mathematics. The attitude toward mathematics was the most drastic change; students now look forward to attending their mathematics class and spend more time out of class doing mathematics. Group leaders gained personal, academic and leadership skills. Detailed descriptions of the results are given. In conclusion, implications of the findings and how they may be used are provided for mathematics instructors, administrators and student support personnel are offered. Recommendations for further research are also suggested.

Horwitz, S., & Rodger, S. H. (2008). *Using Peer-led Team Learning to increase participation and success of under-represented groups in introductory computer science*. Unpublished manuscript. Chattanooga, Tennessee. Retrieved from http://research.cs.wisc.edu/wpis/papers/sigcse09.pdf
This paper describes the implementation and evaluation of a program that uses active recruiting and Peer-Led Team Learning (PLTL) to increase the participation and success of women and minority students in undergraduate computer science. These strategies were applied at eight universities starting in the fall of 2004. There have been some impressive results: succeeded in attracting under-represented students who would not otherwise have taken a CS course; evaluation shows that participation in our program significantly improves retention rates and grades, especially for women; and students in the program, as well as the students who served as peer leaders, are uniformly enthusiastic about their experience.

Hudson, C., Curtis, M., & Blake, R. E. (2001). *Evaluation of the Peer-led Team Learning instructional model: Why does it work?* Conference Proceedings of the 221st American Chemical Society National Meeting, San Diego, CA. For more information, contact the authors at the Department of Chemistry, Indiana University Purdue University Indianapolis, 402 N. Blackford Street, Indianapolis, IN 46202, blake@chem.iupui.edu
Peer-led Team Learning (PLTL) is used at Indiana University Purdue University Indianapolis in chemistry courses. The critical factors associated with PLTL are explored.

Huss-Lederman, S., Chinn, D., & Skrentny, J. (2008). *Serious fun: Peer-led Team Learning in CS.* Conference Proceedings of the 39th SIGCSE Technical Symposium on Computer Science Education, Portland, Oregon.
In the conference session, participants will learn how to use Peer-Led Team Learning (PLTL) effectively in computer science courses. This technique has been successful in reducing drop rates and increasing satisfaction among students. Therefore, it holds promise as a way to boost sagging computer science enrollments in general, and to increase participation of under-represented groups in particular. The goal of the session is to give participants practical information and hands-on experience.

Ibarra, R., & Raikar, A. (2004). *Confronting misconceptions in physics using the Peer-led Team Learning format.* Conference Proceedings of the 227th American Chemical Society National Meeting, Anaheim, CA. For more information, contact the authors at the Department of Math and Science, San Jose City College, 2100 Moorpark Ave., San Jose, CA 95128, rufino.ibarra@sjcc.edu
Peer-led Team Learning (PLTL) was used in a physics course at San Jose City College. Outcomes include increases in students thinking at higher levels both qualitatively and quantitatively

Jevtic, M. (2012). *What traits do peer leaders use to help their students?* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Jevtic-2012.docx
Peer leaders at New York City College of Technology, CUNY (Brooklyn, NY) are selected based on having a minimum GPA of 3.0, completion of MAT 1375 course (pre-calculus) with a grade A or B, and they are interviewed. The requirements are broad, so good peer leaders are not always only those students with the highest GPA or straight As. The crucial aspect is the interview session where interviewers become more familiar with the Peer Leader candidates. By answering questions and responding to different scenarios that the future peer leaders might find themselves in, they are observed in how they think and behave. The interview process is in part a test of emotional intelligence. Emotional intelligence can be learned (Goleman, 2004). Peer leaders are trained through weekly classes and seminars to be able to identify different types of learners and how to adapt their leading to diverse audiences. Leaders learn best through “motivation, extended practice and feedback” (Goleman, 2004, p. 4).

Johnson, E. C., & Loui, M. C. (2009). *How can students benefit as peer leader of learning teams?* Paper presented at the 39th ASEE/IEEE Frontiers in Education Conference, San Antonio, Texas.
In a course for freshmen in electrical and computer engineering, students may choose to attend optional supervised study sessions, which implement Peer-Led Team Learning (PLTL) workshops. In the sessions, students work on difficult problems from previous semesters’ exams under the supervision of a team leader. The team leaders are graduate teaching assistants, undergraduate teaching assistants, and undergraduate volunteers. For two semesters, team leaders were asked to keep weekly reflective journals. The researchers qualitatively analyzed fourteen journals and found

that leaders faced common challenges such as irregular student attendance and inadequate student preparation. Leaders reported that they increased their self-confidence, developed an appreciation for intellectual diversity, and gained an increased interest in teaching Leading PLTL workshops provides an excellent opportunity for personal development. Leaders gain important insights about other students' perspectives and learn to justify and explain their own work. Leading a PLTL workshop enhances the leaders' ability to collaborate in teams and take on leadership roles in the future.

Kalantarian, N. K., Becvar, J. E., Narayan, M., & Saupe, G. B. (2012). *Enhancement of public speaking paved through Peer-Led Team Learning.* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Kalantarian-2012.docx
The Department of Chemistry at the University of Texas at El Paso now uses an innovative constructivist approach to address the individualistic learning styles of students in general chemistry. Through funding from an NSF-STEP grant, UTEP has adopted a strong Peer-Led Team Learning (PLTL) curriculum in second semester general chemistry to emphasize team-based, student-directed learning. Students in this three-credit-hour course are required to attend only two hours of lecture each week by adding a small-section two-hour Workshop overseen by a peer leader. Previously, measures of the effectiveness of PLTL Workshop have focused on evaluating the impact on the students taking the chemistry course. However, peer leaders overseeing the Workshop show significant professional growth including enhancement in their public speaking skills. Surveying current, pre and post peer leaders from our institution prompted the creation of an instrument to assess this enhancement. The researchers reported gains of the leaders in confidence and ease in speaking in front of groups. Further evaluation suggests these gains may be directly correlated with semesters spent as a peer leader.

Kampmeier, J. A. (2000). How to get team savvy. *Chemical Engineering News, 78*, 3.

Kampmeier, J. A. (2001). Peer-Led Team Learning. *Chemical Engineering News, 79*(41), 6.

Kampmeier, J. A. (2003). *The scholarship of teaching*. Unpublished manuscript. City University of New York. New York, NY.
This article provides an overview of the Peer-Led Team Learning (PLTL) program developed at the City University of New York. The author describes the impact of the PLTL program upon teacher preparation of the student peer group facilitators.

Kampmeier, J. A. (2004). *Using Peer-led Team Learning in organic chemistry.* Conference Proceedings of the 228th American Chemical Society National Meeting, Philadelphia, PA. For more information, contact the author at the Department of Chemistry, University of Rochester, Box 270216, University of Rochester, Rochester, NY 14627, kamp@chem.rochester.edu

Peer-led Team Learning (PLTL) was used in a year-long organic chemistry course at the University of Rochester. Program outcomes included higher student performance, higher attitudes towards chemistry, and improved faculty satisfaction.

Kampmeier, J. A., & Roth, V. (2004). *Evolution and institutionalization of peer-led workshops: 1993-present.* Conference Proceedings of the 227th American Chemical Society National Meeting, Anaheim, CA. For more information, contact the author at the Department of Chemistry, University of Rochester, Box 270216, University of Rochester, Rochester, NY 14627, kamp@chem.rochester.edu
Peer-led Team Learning (PLTL) was started in 1993 and since then has spread to more than 100 colleges. At the University of Rochester, nine faculty members in five departments supervise 125 trained PLTL student peer facilitators. This paper outlines critical steps for implementing and managing a PLTL program.

Kampmeier, J. A., Tien, L. T., & Roth, V. (2003). *Peer leader training: A model for preparing future faculty.* Conference Proceedings of the 225th American Chemical Society National Meeting, New Orleans, LA. For more information, contact the authors at the Department of Chemistry, University of Rochester, Rochester, NY 14627, kamp@chem.rochester.edu
Peer-led Team Learning (PLTL) has been used at the University of Rochester (NY) to support higher student achievement in introductory chemistry courses. A special training course was created for the PLTL student peer facilitators who are key to the program success.

Kampmeier, J. A., Varma-Nelson, P., & Wedegaertner (Eds.). (2000). *Peer-Led Team Learning, the workshop project: Organic chemistry*. Upper Saddle River, NJ: Prentice Hall
This book provides strategies for implementing the Peer-Led Team Learning (PLTL) program by other educators in an organic chemistry course.

Kampmeier, J. A., Varma-Nelson. P., & Wedegaertner, D. K. (1999). *The organic workshop project: Peer-led Team Learning.* Conference Proceedings of the 217th American Chemical Society National Meeting, Anaheim, CA. For more information, contact the author at the Science Department, St. Xavier University, 3700 W. 103rd St., Chicago, IL 60655
Peer-led Team Learning (PLTL) was used with undergraduate chemistry students to improve instruction. Overview of the program and training materials for the student PLTL facilitators was shared. Preliminary evaluation studies suggest improved student learning, higher persistence rates, improved teamwork skills, and heightened communication skills..

Kampmeier, J. A., Varma-Nelson. P., & Wedegaertner, D. K. (1999). *The organic workshop project: Peer-led Team Learning.* Conference Proceedings of the 218th American Chemical Society National Meeting, New Orleans, LA. For more information, contact the author at the Science Department, St. Xavier University, 3700 W. 103rd St., Chicago, IL 60655

Peer-led Team Learning (PLTL) was used with undergraduate organic chemistry students to improve instruction. Overview of the program and training materials for the student PLTL facilitators was shared. Preliminary evaluation studies suggest improved student learning, higher persistence rates, improved teamwork skills, and heightened communication skills..

Kampmeier, J. A., Wamser, C. C., Wedegaertner, K. D., & Varma-Nelson, P. (Eds.). (2001). *Peer-Led Team Learning: Organic Chemistry*. Upper Saddle River , NJ: Prentice Hall

Kampmeier, J. A., Wamser, C. C., Wedegaertner, K. D., & Varma-Nelson, P. (Eds.). (2006). *Peer-Led Team Learning: Organic Chemistry* (2nd ed.). Upper Saddle River , NJ: Prentice Hall

Kampmeier, J. A., & Wedegaertner, D. K. (2001). *Peer-Led Team Learning in organic chemistry.* Conference Proceedings of the 221st American Chemical Society National Meeting, San Diego, CA. For more information, contact the author at the Department of Chemistry, University of Rochester, Box 270216, University of Rochester, Rochester, NY 14627, kamp@chem.rochester.edu
Peer-led Team Learning (PLTL) is used at the University of Rochester in chemistry courses.

Keiler, L. S., & Mills, P. (2010). Peer-mediated instruction in high school. Peer-Led Team Learning: Implementation in high schools. *Progressions: The Peer-Led Team Learning Project Newsletter, 12*(1). Retrieved from http://pltlis.org/wp-content/uploads/2012/10/High-School-Implementation-Keiler-Mills-Peer-Mediated-Instruction-in-High-School.pdf.
While educators have long been convinced of the benefits of peer-based learning experiences for all involved, its potential has remained unrealized in K-12 contexts. Logistical issues have dominated decision-making, forcing peer-mediated learning into supplemental contexts, utilized largely for remediation, and extraneous to the primary instructional experience. In contrast, the Math Science Partnership in New York City (MSPinNYC) has developed a model of mathematics and science instruction for the high school classroom that harnesse s the power of peer-mediated learning on a daily basis as the primary learning modality. This model, which we call the Peer Enabled Restructured Classroom (PERC), has profoundly shifted the learning experience of students and teachers in these classrooms, produced dramatic in creases in standardized test scores, and increased student motivation and skills applied across contexts. The name ‘Peer Enabled Restructured Classroom’ emphasizes the complete change in approach to learning and the central role of the peer-instructor, called the Teaching Assistant Scholar, in this process.

Kimbrell, J. B. (2012). *Major components of successful leadership training.* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Kimbrell-2012.docx

Undergraduate leadership training is an integral factor to incorporating the Peer-Led Team Learning (PLTL) Model into the department of an institution. The University of West Georgia's Chemistry Department utilizes the student-influenced leadership training, which involves two primary sections. The first section encompasses a three-day training section before the beginning of scheduled classes. The second section incorporates a "retreat" meeting, which usually occurs four weeks into the semester after the new leaders have had the opportunity to lead three or four workshops. The incorporation of weekly journal entries, leaders meetings, and midterm observations allows for the constant training and improvement of the student leaders throughout the semester. Our primary goal is to always have our leaders evolving and improving the way they lead a workshop and the overall success of the PLTL Model. Chemistry workshop new leader training at the University of West Georgia (UWG) begins with a three-day session prior to the start of class each semester. Other components include weekly journals submitted by new leaders, weekly pre-workshop leaders' meetings (for all leaders), a "retreat" after the third week of each semester, observations of new (and veteran) leaders as they conduct workshops, and discussions based on feedback presented by mid-semester and end-of-semester surveys completed by workshop students.

Komansky, M. (2005). More than just a review session. Peer-led Team Learning: The experience of leading. *Progressions: The Peer-Led Team Learning Project Newsletter, 6*(4). Retrieved from http://pltlis.org/wp-content/uploads/2012/10/Experience-of-Leading-Komansky-More-than-a-Review-Session.pdf.
The authors had been involved in the Peer-Led Team Learning (PLTL) project for Anatomy & Physiology (A&P) for two semesters at Middlesex County College (NJ). In spite of this relatively short time, they generated enormous interest. The PLTL model has broken barriers, helped create friendships and most significantly build confidence of every student involved.

Lazik, L., Conroy, M., Lee, A., Rocha, S., & Kirby, A. (2004). *Peer-led Team Learning: A gateway to teaching opportunities.* Conference Proceedings of the 227th American Chemical Society National Meeting, Anaheim, CA. For more information, contact the author at the Department of Math and Science, San Jose City College, 2100 Moorpark Ave., San Jose, CA 95128, lyun.Larik@sjcc.edu
Peer-led Team Learning (PLTL) was used in a chemistry course at San Jose City College. In addition to the benefits for the participating students, the authors also cited the opportunity for growth by the PLTL student peer facilitators.

Lehr, R. E., & Royt, R. R. (2002). *Use of Peer-led Team Learning techniques to enhance undergraduate organic instruction.* Conference Proceedings of the 224th American Chemical Society National Meeting, Boston, MA. For more information, contact the authors at the Department of Chemistry and Biochemistry, University of Oklahoma, 620 Parrington Oval, Norman, OK 73019, relehr@ou.edu
Peer-led Team Learning (PLTL) has been used at the University of Oklahoma to support higher student achievement in an organic chemistry course.. PLTL was

instituted in part to deal with the challenge of extremely large lecture sections that discouraged high interaction by the students.

Lewis, S. E., & Lewis, J. E. (2005). Departing from lectures: An evaluation of a peer-led guided inquiry alternative. *Journal of Chemical Education, 82*(1), 135-139.
Peer-led Team Learning (PLTL) was combined with a guided inquiry approach to created a modified model called Peer-led Guided Inquiry (PLGI). Use in the chemistry course favored the PLGI participants in comparison with the nonparticipants.`

Ligata, N., & Adamczeski, M. (2000). Perspectives from a female undergraduate student on successfully integrating learning and researching science with leading organic chemistry workshops. In J. Bart (Ed.), *Women Succeeding in the Sciences: Theories and Practices Across Disciplines* (pp. 139-148). Indianapolis, IN: Purdue University Press

Light, G., & Micari, M. (2013). *Making scientists: Six principles for effective college teaching*. Cambridge, MA: Harvard University Press.
Northwestern University created the Gateways Science Workshop (GSW) and the Sciecne Research Workshop (SRW) to support students enrolled in challenging courses. Based on more than a decade of the GSW and SRW serving the needs of students, learning principles have emerged that were critical to their success: (a) learning deeply, (b) engaging probloems, (c) connecting peers, (d) mentoring learning, (e) creating community, and (f) doing research. The book's first chapter provides more background on the GSW and SRW and succeeding chapters examine each of these principles individually. The authors use the lessons learned from working with the students to apply them more widely as pedagogies for instructors to adopt and implement in their classes. A variety of educational theories and programs had an influence on creation of GWS and SRW. One that is often mentioned is Peer-led Team Learning.

Liou-Mark, J. (2002). Leading Workshops at Brooklyn International High School. Peer-Led Team Learning: Implementation in high schools. *Progressions: The Peer-Led Team Learning Project Newsletter, 3*(3). Retrieved from http://pltlis.org/wp-content/uploads/2012/10/High-School-Implementation-Liou-Mark-Leading-Workshops-Brooklyn-International-HS.pdf.
New York City College of Technology (NYCCT) students who took the Peer-Led Team Learning (PLTL) eader training course at the City College of New York (CCNY) via videoconferencing have had an opportunity to tutor students in mathematics at the Brooklyn International High School. Once a week during the Spring 2002 semester, these students helped prepare 9th and 10th grade students for the Mathematics Regents A* examination. This experience gave students the opportunity to apply the Workshopmodel at a local high school. These NYCCT students are also enrolled in the Teacher Preparation Program at CCNY (Ellen Goldstein, Co-PI). As part of the program, they are required to take the Peer Leader Training course as an introductory course to teaching. These students are mostly associate-degree computer science

majors interested in teaching mathematics. They then are encouraged to transfer to CCNY and complete their Bachelor's degree.

Liou-Mark, J., Lansiquot, R. D., Yu, K., Dreyfuss, A. E., Blake, R., Zeng, S., & Jevtic, M. (2012). *Supporting a community of women in STEM through the navigation by mentoring and peer leadership program.* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Liou-Mark-2012.docx
The retention and persistence rates of females majoring in mathematics have been consistently lower than their male peers. The disparity in the rates of minority females graduating in mathematics at the baccalaureate level continues to be a national challenge. Through the support of the Tensor Foundation and Mathematical Association of America Women and Mathematics grant, the Navigation by Mentoring and Leadership (NML) program at the New York City College of Technology of the City University of New York was designed to address these major issues. This program is based on the Peer-Led Team Learning (PLTL) program developed initially at the City University of New York. The goal of eradicating gender disparities in Mathematics and other Science, Technology, Engineering, and Mathematics (STEM) areas can be assisted by creating a matrix of academic and social support structures for women. These structures include a multi-tiered mentoring program in which role-modeling and leadership skills are enhanced through the Peer-Led Team Learning instructional model.

Lu, C. (2012). *Hosw can the peer leader support students' learning in workshop?* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Lu-2012.docx
Peer-led workshops usually consist of 6-8 students who come together to discuss and solve problems on modules given to them each week. Workshop students often lack confidence in their ability to solve problems in mathematics. Comparison is a big factor in lack of confidence, especially in group-based work. Students usually compare themselves with others based on how fast they could learn new material or complete assignments. Students also compare their own abilities to contribute to teamwork to their teammates, resulting in hesitating to ask for help. Grades and the amount of material students master is also a big factor to compare. Gender roles are another factor in lack of confidence. Men usually conclude they are superior to their peers and women usually conclude they are inferior. When facing challenges, women tend to dwell on their failures and men only rarely. In situations where students find themselves inferior to others, they lose confidence. Faculty play a big part in increasing confidence in students; they could also explain to students that how long it takes to solve a problem is less important than understanding and solving it.

Lyle, K. S., & Robinson, W. R. (2003). A statistical evaluation: Peer-Led Team Learning in an organic chemistry course. *Journal of Chemical Education, 80*(2), 132-134.
This report documents the impact of Peer-Led Team Learning (PLTL) in an organic chemistry course taken by sophomore students at a small research college in the

eastern United States. Participating students outscored their counterparts by a statistically significant level. The effect size was 0.64 which is large. This was consistent for all student subpopulations regardless of gender or ethnicity.

Lyon, D. C., & Lagowski, J. J. (2008). Effectiveness of facilitating small-group learning in large lecture classes: A general chemistry case study. *Chemical Education Research, 85*(11), 1571-1576.
This article reports on the use of Peer-led Team Learning (PLTL) in a large, 400 student general chemistry course that is usually taught in a traditional lecture format. The administrative structure, the training of the PLTL facilitators, and the achievement of the students is compared with a control group.

Malik, D. J. (2002). *Improving the transition from secondary to higher education in a large urban public university: Recognizing the role of PLTL.* Conference Proceedings of the 224th American Chemical Society National Meeting, Boston, MA. For more information, contact the author at the Department of Chemistry, Indiana University Purdue University Indianapolis, Indianapolis, IN 46202, malik@chem.iupui.edu
Peer-led Team Learning (PLTL) has been used at Indiana University Purdue University Indianapolis to support higher student achievement in introductory science courses. PLTL is viewed as a critical program for helping high school students quickly make the adjustment to the academic rigor of challenging college courses.

Malik, D. J. (2004). *Creating a culture for PLTL: Selling the faculty and administration.* Conference Proceedings of the 227th American Chemical Society National Meeting, Anaheim, CA. For more information, contact the author at the Department of Chemistry, Indiana University Purdue University Indianapolis, 402 N. Blackford Street, Indianapolis, IN 46202, malik@chem.iupui.edu
Peer-led Team Learning (PLTL) was used in a chemistry course at Indiana University Purdue University Indianapolis. A number of recommendations are presented for marketing of the PLTL to fellow faculty members and administrators that align the program with institutional mission and priorities.

Marcano, Y., Velez, A., & Fraiman, A. (2003). *Implementation of PLTL in sophomore organic chemistry at Northeastern Illinois University.* Conference Proceedings of the 25th American Chemical Society National Meeting, New Orleans, LA. For more information, contact the author at the Department of Chemistry, Northeastern Illinois University, 5500 North St. Louis, Chicago, IL 60625, y-marcano@neiu.edu
The Peer-Led Team Learning (PLTL) program is used with the general chemistry courses at Northeastern Illinois University since Fall 2002. The authors share program outcomes and challenges with implementation of the model.

McCreary, C. L., Golde, M. F., & Koeske, R. Peer instruction in the general chemistry laboratory: Assessment of student learning. *Journal of Chemical Education*.

Micari, M. (2014). *Mentoring learning in the STEM disciplines*. Unpublished manuscript. Northwestern University.

SESP 291 is a one-credit course taken over three academic quarters. It is designed to provide facilitators in the Gateway Science Workshop (GSW) program [based upon Peer-led Team Learning] an opportunity to develop as leaders and as learning mentors. In particular, the course aims to enhance your knowledge, understanding, and practical skills in facilitating groups, coaching peers, and promoting meaningful learning in the STEM (science, technology, engineering, and math) disciplines. The course integrates three essential components of learning – academic knowledge, "on-the-job" training, and engagement with a learning community – to create a unique undergraduate learning experience at Northwestern. The goals for the course are for the GSW mentors to (a) gain practical facilitation skills; (b) become familiar with, and critically engage with, learning theory and research, and bring this knowledge into your GSW mentoring; (c) gain knowledge of the dynamics of small groups, and bring this knowledge into your GSW mentoring; (d) become familiar with the process of conducting educational research, and begin to critically evaluate classroom practices through a research lens; and (e) reflect on facilitation practice and develop self-evaluation skills.

Micari, M., Gould, A. K., & Lainez, L. (2010). Becoming a leader along the way: Embedding leadership training into a large-scale peer-learning program in the STEM disciplines. *Journal of College Student Development, 51*(2), 218-230.
Although many college students enter leadership programs with the express goal of developing leadership skills, some specialized leadership programs draw students who seek to gain expertise in a disciplinary area, with leadership development as a secondary goal. The Gateway Program is based on Peer-led Team Learning. In the latter case, program developers face the challenge of generating enthusiasm among student participants for thinking and talking about leadership.This paper addresses the question of whether undergraduates can develop as leaders when thatis not their explicit goal, chronicling the evolution of a program designed to do just that. Data collected through survey and interview research suggest that participating students do indeed develop as leaders in meaningful ways.

Micari, M., & Light, G. (2009). Reliance to independence: Approaches to learning in peer-led undergraduate science, technology, engineering, and mathematics workshops. *International Journal of Science Education, 31*(13), 1713-1741.
The phenomenographic 'approach to learning' literature holds that students' approaches to learning can change depending on the learning context. This implies that, by modifying the learning context, teachers can change the way students approach learning, and this can ultimately lead to a change in learning outcomes. The study presented here examines one effort to modify a science, technology, engineering, and mathematics (STEM) learning context and the approaches to learning taken by students experiencing this environment. Using a qualitative, phenomenographic approach, we interviewed 45 students in a STEM peer-led workshop programme at Northwestern University, a research-intensive university. Similar to previous approach-to-learning research, the study identified three approaches students took to learning in the peer-led programme, in which they focused on simply making it through the course, engaging

more meaningfully with the material, and gaining better control over their own learning. The Gateway Science Workshops program was developed at Northwestern.

Micari, M., Streitwieser, B., & Light, G. (2006). Undergraduates leading undergraduates: Peer facilitation in a science workshop program. *Innovative Higher Education, 30*(4), 269-288.
This article presents the results of a study at Northwestern University concerning experiences of undergraduate students serving as facilitators of Peer led Team Learning (PLTL) sessions for introductory undergraduate sciences and engineering course. The PLTL facilitators reported growth in a variety of areas: cognitive growth (consolidating knowledge in the discipline, enhancing conceptual understanding, and developing problem-solving skills); personal growth (communication skills in confidence, audience understanding, and self-expression;pedagogical skills; improved ability to explain concepts; and skill at learning to allow students to work out their ideas on their own without interrupting to offer guidance; understanding the role of the teacher); and instrumental growth (career development and striving to achieve professional goals).

Miller, I., & Novelette Sadler-McKnight, N. (2012). *Implementation and institutionalization of PLTL in a Caribbean university: Successes, challenges, and implications.* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/McKnight-PLTLIS-2012.pptx
Peer-Led Team Learing (PLTL) workshops significantly improved performance in introductory chemistry as well as increased student self confidence and attitude towards chemistry. Participation in both semester results in better performance than in one semester only. The PLTL model provides an atmosphere in which students freely express themselves, show less fear of failure, and develop the self- confidence and problem solving skills that are necessary for independent learning. Results point to the need for institutionalization of the PLTL model to include all Year 1 students as well as other subjects e.g Math, Phys etc. Need for a PLTL programme director who can focus on coordinating the programme and need to revisit our mode of instruction.

More, T., & Hill, G. (2002). *Integrating calculus and general physics using a workshop and peer-leader approach.* Conference Proceedings of the International Conference on Transforming Math and Science Education in the K16 Continuum, Arlington VA. Retrieved from
http://k12s.phast.umass.edu/stemtec/pathways/Proceedings/Papers/More-p.pdf
Peer-led Team Learning (PLTL) is being used in an integrated introductory physics and calculus course at the University of Portland to address several persistent problems in student learning: poor conceptualization and retention of material, under-developed problem-solving skills, and difficulty actively applying knowledge across disciplines. The course and dedicated laboratory will also improve training of both pre-service and in-service K-12 teachers. The course will be integrated in terms of content, pedagogy and classroom design. Going beyond a “just in time” approach in which mathematics is often subordinate to physics, the professors tale advantage of the integration, organizing the course around ‘threads’ in which the subjects reinforce and motivate each other. I

Working in small groups on investigative activities with supervising peer-leaders and a faculty member overseeing the entire class, students will make connections across disciplines in one classroom environment using a common set of tools. Lecture, hands-on learning, and computer usage will be integrated with group activities such as experimentation and joint problem-solving. Using the PLTL model, the conference workshop will follow one or more ‘threads’ through a semester. Participants will also have the opportunity to suggest, discuss, and develop additional activities supporting these threads.

Mullins, J. J. (2003). *The effectiveness of Peer-led Team Learning workshops in organic chemistry instruction at Le Moyne College.* Conference Proceedings of the 225th American Chemical Society National Meeting, New Orleans, LA. For more information, contact the authors at the Department of Chemistry, Le Moyne College, 1419 Salt Springs Road, Syracuse, NY 13214, mullinjj@lemoyne.edu
The Peer-Led Team Learning (PLTL) program is used with the general chemistry courses at Le Moyne College (NY) beginning in 2002. Participating students earn higher grades than nonparticipants. Surveys suggest that students are highly satisfied with PLTL.

Muniz, J., Saupe, G., Becvar, J. E., & Narayan, M. (2012). *A speed of one molar per second presents some blocks In the road.* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Muniz-2012.docx
It is challenging for students in general chemistry to recognize that every chemical reaction is associated with a rate (speed). Peer Leaders in second semester general chemistry have found a ‘solution’: provide students in Workshop with oversized Lego®-like blocks in a large clear bag. These blocks can be used to represent molecules composed of atoms with appropriate combining properties. The blocks permit visualization of amounts of reactants and products in a chemical reaction like 1) H2 and O2 to produce H2O (burning of hydrogen) or 2) CH4 and O2 to produce CO2, and H2O (combustion of methane). Concentrations of reacting species can be followed as the reaction progresses by having student teams play close attention to the rearranging block combinations over time. Reacting a certain amount (e.g. one molar) of the combustible reactant per unit time can be easily represented to reconcile and visualize the abstract concept of “rate of a chemical reaction”. Moreover, altering the starting ‘concentrations’ of reactants (differing initial numbers of block combinations) permits students to understand two difficult concepts: limiting reagent and final concentrations at completion or at equilibrium. The ‘blocks’ transform an obstacle into a vehicle for students to ‘get’ the speed of reaction.

Nakamura, M., & Wilder, S. (2012). *Peer leaders' training - workshop style.* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Nakamura-2012.docx
Typically workshop leaders are trained in a general classroom setting, one faculty member explaining the requirements and objectives of the workshop style to a

classroom full of prospective leaders. The University of Houston-Downtown (UHD) has adapted the Peer-Led Team Learning (PLTL) training model to better suit the needs of both the students and the university by incorporating the workshop ideal into the training itself. UHD leaders experience first-hand the benefits of the workshop style and are given the chance to become familiar with the student's perspective before they begin running workshops themselves. The number of prospective leaders to be trained every semester has been reduced in accordance to the workshop style. Approximately 8 students undergo training per semester, with 11 sessions in total. The group meets for 1 hour each week under the guidance of a peer-coordinator to discuss topics from the Handbook for Team Leaders (Roth, Goldstein and Marcus, 2001). Peer-coordinators are previously trained leaders chosen due to their interest in education; their objective is to guide the leaders through their training in a manner that workshops should be conducted. Leaders are required to read through the section of the handbook to be discussed that week, reflect over, and then answer 3-6 questions as assignment so that they can be prepared to collaborate in the workshop. The materials used in the training workshops are created by the faculty supervisor, then given to the peer-coordinator to modify according to the group's particular needs. The coordinator offers all modifications up for approval to the supervisor as well as reviews after every workshop session is completed to ensure a constant flow of communication throughout the semester.

Narode, R. (2001). PLTL and the future of science teacher education. Peer-Led Team Learning: Implementation in high schools. *Progressions: The Peer-Led Team Learning Project Newsletter, 2*(2). Retrieved from http://pltlis.org/wp-content/uploads/2012/10/High-School-Implementation-Narode-PLTL-Future-of-Science-Teacher-Education.pdf.
The current shortage of math and science teachers (especially physical science teachers) is exacerbated by two important factors: 1) a strong economy offering excellent employment opportunities with higher starting salaries, faster financial growth, and greater status than teaching, and 2) a culture among scientists that encourages students to become scientists far more frequently than to become teachers of science. While PLTL cannot directly change the first of these factors it can directly and indirectly address the second factor. By supporting Peer-Led Team Learning (PLTL) faculty with initial funding, professional development, inquiry-based curriculu m for student-led workshops, guides for workshop development, and continuing education of workshop leaders, the PLTL Model educates college science faculty about the potential of students as teachers / learning-facilitators. The student workshop leaders themselves awaken faculty to the understanding that their talents ought to be directed toward the profession of teaching. Furthermore, the presence and support of learning specialists in collaboration with PLTL science faculty and workshop leaders complete the connection to teacher education.

Okoro, J. (2012). *How can the peer leader help students' learning through questioning?* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Okoro-2012.docx

The most common question peer leaders often ask themselves is how can they improve on maintaining the students engaged and interested in learning a certain topic. One way of improving on this is to observe how students learn and process information taught in class.

Parente, A. D. (2010). The scholarship of Peer-Led Team Learning: My progression from student leader to faculty. Peer-Led Team Learning: The experience of leading. *Progressions: The Peer-Led Team Learning Project Newsletter, 12*(1). Retrieved from http://pltlis.org/wp-content/uploads/2012/10/Experience-of-Leading-Parente-The-Scholarship-of-Peer-Led-Team-Learning.pdf.
This is a first-hand account to a student facilitator involved with the Peer-led Team Learning (PLTL) program. Twenty years ago, I was an undergraduate majoring in Biology and Chemistry, struggling with the desire to integrate the details I had learned in my Chemistry courses with the 'big picture' philosophy stressed in myBiology curriculum. These early educational experiences fostered my passion for curricula geared towards interdisciplinary learning and in programs designed to increase awareness of alternative learning styles and pedagogies for instruction. My Workshop journey began five years later, shortly after the program's inception in Organic Chemistry at the University of Rochester under the direction of Jack Kampmeier. To this day, I can't remember how I became involved with this program, but know it was a life-changing opportunity with incredible people that played a centralrole in shaping my academic career.

Pazos, P., Micari, M., & Light, G. (2010). Developing an instrument to characterise peer-led groups in collaborative learning environments: assessing problem-solving approach and group interaction. *Assessment & Evaluation in Higher Education, 35*(2), 191-208.
Collaborative learning is being used extensively by educators at all levels. Peer-led team learning in a version of collaborative learning that has shown consistent success in science, technology, engineering and mathematics disciplines. Using a multi-phase research study we describe the development of an observation instrument that can be used to assess peer-led group learning. This paper illustrates the development of a classification system for peer-led learning groups and an instrument based on this classification system. The instrument evaluates small learning groups on two important aspects of group learning: problem solving approach and group interaction style. We provide evidence of the factor structure of the two dimensions using both exploratory and confirmatory factor analysis. We also provide information about the reliability of the two scales as measured by the Cronbach's alpha coefficient. Data from a large peer-led learning programme was used to conduct the factor analysis. Results from the factor analysis confirmed that the instrument is actually measuring two key characteristics of small learning groups: problem solving approach and group interaction style, characteristics that have been linked to effective functioning of the group and to the student learning outcomes. This instrument may be particularly appealing to practitioners (faculty members, those running small-group learning programmes, etc.) because it is easy to use and it does not require extensive time for analysis.

Peteroy-Kelley, M. A. (2007). A discussion group program enhances the conceptual reasoning skills of students enrolled in a large lecture-format introductory biology course. *Journal of Microbiology & Biology Education, 8*, 13-21.

Piaku, A. (2012). *How can the peer leader help students in workshop trust their partner's knowledge?* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Plaku-2012.docx
I became interested in assisting the students in workshop to be more cooperative as a team by using the pair problem-solving method. This method helped the students communicate openly with each other by breaking the barriers of not being afraid or intimidated. Working in small groups students were able to discuss the workshop tasks and as a result, they built trust by performing better in Math 1175 (Fundamentals of Mathematics).

Platt, T. (2006). *Peer-Led workshops: Leader training and cooperative examinations*. Unpublished manuscript. Paper presented at Annual Conference on Case Study Teaching in Science, October 6-7, 2006. Buffalo, NY.
This paper presents the results of the use of cooperative examinations in the classes that were supported by the Peer-led Team Learning (PLTL) program. Students were given a large number of potential exam questions ahead of time with only a small subset actually presented on the unit exam. Individually and during PLTL sessions the students worked on these questions. Six important advantages to the "cooperative examination" model emerged from their study (supporting recent similar findings from others): (1) the anxiety level was much lower (there were no surprises, and students who diligently prepared aU10 answers were guaranteed to do well), (2) cram all nighters were eliminated(students realized it would be impossible, so began working on their answers as soon as the questions became available),(3) competition between students was diminished and much active learning occurred (as students worked together to formulate their best answers), (4) cheating was reduced (more tempting when rote answers are needed), (5) students worked harder and studied substantially longer, both alone and with others, in preparing for the exam, and (6) they engaged with a greater number and variety of resources, in seeking understanding rather than rote answers.

Platt, T., Barber, E., Yoshinaka, A., & Roth, V. (2003). An innovative selection and training program for Problem-based Learning (PBL) workshop leaders in biochemistry. *Biochemistryand Molecular Biology Education, 31*(2), 132-136.
A version of Peer-led Team Learning (PLTL) was implemented at the University of Rochester in New York. Traditional recitation sections were replaced in a large upper level biochemistry course with PLTL. A key factor in the program's success was extensive training of the PLTL student facilitators..

Platt, T., Barber, E., Yoshinaka, A., & Roth, V. (2003). Problem-based learning: An innovative selection and training program for problem-based learning (PBL) workshop leaders in biochemistry. *Biochemistry and Molecular Biology Education, 31*, 132-136.

Platt, T., Roth, V., & Kampmeier, J. A. (2008). Sustaining change in upper-level courses: Peer-led workshops in organic chemistry and biochemistry. *Chemistry Education Research Practices, 9*, 144-148.

Preszler, R. W. (2009). Replacing lecture with Peer-led workshops improves student learning. *CBE-Life Education, 8*(3), 182-192. Retrieved from http://www.lifescied.org/content/8/3/182.full.pdf+html.
Peer-facilitated workshops enhanced interactivity in an introductory biology course, which led to increased student engagement and learning. This approach was based on the Peer-Led Team Learning (PLTL) model. A majority of students preferred attending two lectures and a workshop each week over attending three weekly lectures. In the workshops, students worked in small cooperative groups as they solved challenging problems, evaluated case studies, and participated in activities designed to improve their general learning skills. Students in the workshop version of the course scored higher on exam questions recycled from preworkshop semesters. Grades were higher over three workshop semesters in comparison with the seven preworkshop semesters. Although males and females benefited from workshops, there was a larger improvement of grades and increased retention by female students; although underrepresented minority (URM) and non-URM students benefited from workshops, there was a larger improvement of grades by URM students. As well as improving student performance and retention, the addition of interactive workshops also improved the quality of student learning: Student scores on exam questions that required higher-level thinking increased from preworkshop to workshop semesters.

Pyatt, R. E., Rosser, T., & Powell, K. (2009). Undergraduates as science museum docents: Training students to be the teachers using Peer led Team Learning. *The American Biology Teacher, 71*(1), 16-19.
This article describes how the Fernbank Museum of Natural History trained undergraduate students as docents for The Genomic Revolution exhibit. Methodology from Peer led Team Learning (PLTL). The best elements of PLTL were important for the docents to acquire: good communication abilities, demonstrate knowledge of the content material, and strong leadership skills. Rather than focusing on a class of students who were preparing for exams, this application of PLTL was focused on helping groups of visitors to the museum exhibit to interact with the learning content and with one another to increase their learning outcomes. The student docents reported that as a result of their experience they learned more about the content material of the exhibits.

Quitadamo, I. J., Brahler, C. J., & Crouch, G. J. (2009). Peer-led Team Learning: A prospective method for increasing critical thinking in undergraduate science courses. *Science Educator, 18*(1), 29-39. Retrieved from http://www.eric.ed.gov/ERICWebPortal/contentdelivery/servlet/ERICServlet?accno=EJ851877.
Peer-Led Team Learning (PLTL) is a specific form of small group learning recognized by Project Kaleidoscope as best practice pedagogy (Varma-Nelson, 2004). PLTL was

first developed by Woodward, Gosser, and Weiner (1993) as an integrated method that promoted discourse and creative problem solving in chemistry at the City College of New York. It is characterized by a cohort-based social learning structure whereby trained undergraduates, or "peer leaders", guide 4-8 less experienced peers toward conceptual understanding through group-focused science and math problem solving. This study examines the impact of PLTL on critical thinking gains in science and math courses at a research university in the Pacific Northwest. Results of this study show that PLTL has a small but positive impact on critical thinking gains in some science courses, and that it improves grade performance and retention in science and math courses, particularly for females. While math students did not show significant critical thinking gains, it is premature to conclude that PLTL does not promote critical thinking in math. Many factors affect the development of critical thinking skills, and more study is necessary to discover their influence. These results indicate PLTL has potential to improve undergraduate critical thinking. (Contains 2 figures and 3 tables.)

Raab, M. M., & Jodis, Stephen M. (2012). *Training student facilitators to lead peer-led group discussions in computing and the sciences.* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/cilitators_CollaborativeLearningProgram_MRaab_pptversion.ppt
Saint Vincent College offers the opportunity for Peer-Led Team Learning through the Collaborative Learning Program (CLP). Upper-class student facilitators, who were hand-selected by their departmental faculty, lead freshmen and sophomore discussion and problem solving groups in the science and computing disciplines. Each year the CLP provides a summer training workshop for 8-10 new student facilitators. The workshop is divided into 3 phases. The Initiation Phase helps the students get to know each other through engaging in Ice Breaker Games and Activities. The workshop then proceeds to the Methodology Phase where students learn the pedagogy of the CLP Program. Facilitators also learn how to integrate various study skills and strategies into their CLP sessions including Time Management, Note-Taking Styles, and Learning Styles. The final stage of the workshop is the Hands-On Phase. Student facilitators practice mock sessions to feel more prepared and confident in leading a solo session during the upcoming academic year.

Roth, V., Goldstein, E., & Marcus, G. (Eds.). (2001). *Peer-Led Team Learning: A handbook for team leaders*. Upper Saddle River, NJ: Prentice Hall
This book provides strategies for implementing the Peer-Led Team Learning (PLTL) program by other educators. This book offers suggestions for successful implementation including how to write effective group problems and how to train peer leaders.

Samaroo, D. (2012). *Peer-Led Team Learning: A general chemistry approach.* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Samaroo-2012.docx

Peer-led team learning (PLTL) has been implemented in General Chemistry at New York City College of Technology. The approach used in chemistry involves workshops consisting of problem sets developed by the Chemistry course instructor. These problem sets include textbook problems as well as practice examination questions. The effectiveness of peer-led team learning at New York City College of Technology entails that attendance is required, as opposed to encouraged at workshops. Comparative data prior to and after implementation of PLTL will demonstrate improvement in grades as well as understanding chemical concepts.

Sarquis, J. L., & Detchon, J. C. (2006). *The PLTL experience at Miami University*. Miami University. Oxford, OH.
In comparison with other sections of general chemistry, the population of the Peer-led Team Learning (PLTL) class has a statistically significant difference in Math SAT scores (588, PLTL; 625 and 620 non-PLTL; $p = .005$). Students in three sections were given the ACS First-Semester General Chemistry Exam, and it was found that the PLTL section did score lower, but the difference was not statistically significant (44.1, PLTL; 45.1 and 47.0, non-PLTL; $F(2, 400) = 2.276$, $p = .05$). Therefore the conclusion of the researchers is that the PLTL model is boosting the performance of the PLTL student to a level almost comparable to their counterparts in the traditional course even though the PLTL students are "at risk" based on their math preparation that has been known to be a predictor for success in general chemistry.

Sarquis, J. L., Dixon, L. J., Gosser, D. K., Kampmeier, J. A., Roth, V., Strosak, V. S., & Varma-Nelson, P. (2001). The workshop project: Peer-Led Team Learning in chemistry. In J. E. Miller, J. E. Groccia & M. S. Miller (Eds.), *Student assisted teaching: A guide to faculty-student teamwork* (pp. 150-155). Bolton, MA: Anker Publishing Company
This book chapter describes the Peer-Led Team Learning (PLTL) program as it is used with a chemistry course.

Sawyer, K., Frey, R., & Brown, P. (2013). Knoowledge building discourse in Peer-led Team Learning Grops in first-year general chemistry. In D. D. Suthers (Ed.), *Productive multivocality by the analysis of group interactions, computer-supported collaborative learning series 16* (pp. Chapter 10). New York, NY: Springer Science+Business Media.doi:10.1007/978-1-4614-8960-3_9.
o better understand the interactional mechanisms that make PLTL effective, we closely examined videotapes of two PLTL groups as they both solved the same chemistry problem. In one group, students engaged in group knowledge building: intellectual conversations where they asked each other questions, provided procedural and conceptual explanations, and closely monitored each others’ understanding of the problem. This led to an increasingly accurate understanding of the problem. In the contrasting group, their conversations focused on rote application of formulas as they worked to calculate a “correct” solution. Our analyses help us to understand what effective collaborative discourse looks like, and have practical implications for how peer leaders are trained and for how peer groups are organized.

Sawyer, K., Frey, R., & Brown, P. (2013). Peer-led Team Learning in general chemistry. In D. D. Suthers (Ed.), *Productive multivocality by the analysis of group interactions, computer-supported collaborative learning series 16* (pp. 183-190). New York, NY: Springer Science+Business Media.doi:10.1007/978-1-4614-8960-3_9.
This chapter describes the setting and context of the discourse that occurs during Peer-led Team Learning in first-year General Chemistry at Washington university in St. Louis. PLTL is designed to faciloitate chemistry literacy and success for all students, not only for chemistry majors by supplementin ghte lecture with formalized study groups that provide opportunities for active and collaborative lerning.

Schray, K., Russo, M. J., Egolf, R., Lademan, W., & Gelormo, D. (2009). Are in-class peer leaders effective in the Peer-led Team Learning approach? *Journal of College Science Teaching, 38*(4), 62-67.
Peer-led team learning (PLTL) has been widely adopted for enhanced learning in a variety of disciplines, mostly in introductory chemistry, but also in organic chemistry, as in this study (Tien, Roth, and Kampmeier 2002). This pedagogical approach forms student groups led by students who have previously done well in the course (standard peer leaders). This study shows that in-class peer leaders (students currently taking the class) can perform group leadership as effectively as standard peer leaders, enabling easier implementation of this pedagogy. (Contains 4 tables and 1 figure.)

Sibert, J., Goeckner, M., Galley, D., & Goldammer, K. (2013). *Lowring barriers to enhance 2 + 2 transfer student success, persistence, and retention: The Dallas STEM Gateways Collaborative.* Conference Proceedings of the 2013 ASEE Gulf Southwest Annual Conference, Arlington, TX. Retrieved from http://aseegsw.com/past%20Proceedings/2013%20Proceedings/Abst_galley.pdf
The University of Texas at Dallas, Collin College, and Richland College of the Dallas County Community College District have established a joint effort, the NSF-sponsored Dallas STEM Gateways Collaborative, to significantly increase the number of undergraduate students completing degrees in Science, Technology, Engineering, and Mathematics (STEM) in the North Texas region. Building upon previous cooperation among these three institutions and the remarkable concentration of high-tech businesses in the Dallas-Fort Worth Metroplex, the Collaborative has implemented best-practice methods to bring about a cultural change that will lead to a sustained increase in the production of STEM-trained graduates. First, the Collaborative has strengthened recruitment into introductory STEM courses and expanded the use of studentmentoring within those courses to encourage student selection of STEM majors and classroom success. Second, it has increased opportunities for internships and undergraduate research experiences for students early in their college career to encourage students to remain committed to the pursuit of STEM majors. Finally, a concerted effort of curriculum alignment across all STEM fields at the three participating institutions combined with a formal professional development program aimed at spreading effective pedagogical techniques across all threeinstitutions has been designed to enhance teaching effectiveness at the critical introductory level. The Dallas STEM Gateways Collaborative programis built to enhance the number, quality, anddiversity of undergraduates successfully earning STEM degrees.

Sidoine, G. (2009). Running a good workshop takes more than training the Peer Leader. Peer-Led Team Learning: Leader training. *Progressions: The Peer-Led Team Learning Project Newsletter, 10*(4). Retrieved from http://pltlis.org/wp-content/uploads/2012/10/Experience-of-Leading-Sidoine-Running-a-Workshop.pdf.
The Peer-led Team Learning (PLTL) research project was based on observations of the author while leading a Mathematics Workshop over a 15-week period during the Spring 2009 semester, as well as readings based on materials presented in an independent study course required for first-time Peer Leaders. The objective of the independent study course is to equip workshop leaders with the necessary skills and competence to facilitate peer-assisted learning apart from the classroom settings. The workshop leader is provided with the flexibility to implement techniques and ideas about learning. This helps to discover the hidden ability in the students and to allow them todiscover different ways of learning the course material.

Smith, J., Wilson, S. B., Banks, J., Zhu, L., & varma-Nelson, P. (2014). Replicating Peer-Led Team Learning in cyberspace: Research, opportunities, and challenges. *Journal of Research in Science Teaching, 51*(6), 714-740. doi:10.1002/tea.21163.
This quasi-experimental, mixed methods study examined the transfer of a well-established pedagogical strategy, Peer-Led Team Learning (PLTL), to an online workshop environment (cPLTL) in a general chemistry course at a research university in the Midwest. The null hypothesis guiding the study was that no substantive differences would emerge between the two workshop settings. Students in the PLTL (n = 220) condition were more satisfied with their workshop and earned statistically significantly higher course grades, yet earned comparable standardized final exam scores. They also had lower incidence of students' earning D or F course grades or withdrawing from the course (DFW rates) than students in the cPLTL setting (n = 175). Interviews with 10 peer leaders and 2 faculty members, as well as discourse analysis of workshop sessions, revealed more similarities than differences in the two conditions. The final exam scores and discourse analysis support the null hypothesis and use of both face-to-face and synchronous online peer-led workshops in early science courses

Snyder, J. J. (2012). *Peer Led Team Learning in introductory biology: Effects on critical thinking skills.* (Ph.D. dissertation), Syracuse University, Syracuse, NY.
This study evaluated the potential effects of the Peer-Led Team Learning (PLTL) instructional model on undergraduate, biology peer leaders' critical thinking skills. This investigation also explored peer leaders' perceptions of their critical thinking skills. A quasi-experimental pre-test/post-test with control group design was used to determine critical thinking gains in PLTL/non-PLTL groups. Critical thinking was assessed using the California Critical Thinking Skills Test (CCTST) among participants who had previously completed and been successful in the second semester of a two-semester introductory biology course sequence. Qualitative data from open-ended questionnaires confirmed that factors thought to improve critical thinking skills such as interaction with peers, problem solving, and discussion were perceived by participants to have an impact on critical thinking gains. However, no significant quantitative differences in peer leaders' critical thinking skills were found between pre- and post-treatment CCTST

measurements nor between experimental and control groups. Additionally, students led by peer leaders attained significantly higher exam and final course grades in introductory biology than similar students not participating in PLTL. Finally, among introductory biology students who opted not to enroll in the associated lab course, those who participated in PLTL averaged more than a letter grade higher than those who did not, and this difference was statistically significant.

Staff. (2005). Peer-led Team Learning, fewer lectures: More learning. *The Teaching Professor, 16*(3), 5.
This short article describes Peer-led Team Learning (PLTL). Results from a general chemistry class indicate that participants earned higher final course grades.

Staff (Ed.). (2005). *Progressions Newsletter*. New York City, NY: City University of New York.Retrieved from http://www.pltl.org
Progressions is the official newsletter of Peer-Led Team Learning. It provides program overview information, data studies, and information about training workshops.

Stanlec, A. C., & Doerr, H. M. (2012). *Flexible and sustainable interventions for mathematics support of first-year students.* Conference Proceedings of the American Society for Engineering Education 2012 Annual Conference. Retrieved from http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CGUQFjAA&url=http%3A%2F%2Fwww.asee.org%2Ffile_server%2Fpapers%2Fattachment%2Ffile%2F0002%2F2920%2FASEE_Final_Draft.pdf&ei=5k0WUKnyPIaa9gTknoGYBA&usg=AFQjCNG-87XAz4jYI9F93arWeWB7dw5YqA
According to the researchers, initial results from Syracuse University were surprising, promising, and provide directions for future work. They adapted the Peer-led Team Learning (PLTL) model for use at their institution. They named their program Peer-Led Study Groups (PLSG). One of the most surprising results of our pilot was the overall low participation in the pre-Calculus PLSGs but satisfactory participation in the Calculus I PLSGs. The researchers anticipated that students would take advantage of the flexible nature of the PLSGs and move in and out of different sessions based on their needs throughout the semester. However, the students who participated in the PLSGs were largely those who came at the beginning of the semester and continued to attend for the entire semester. The Calculus I students were engaged from the beginning and continued to utilize the PLSGs throughout the semester while the pre-Calculus PLSGs never seemed to gain momentum and saw only sporadic attendance. Another surprise was that the Facebook pages and the virtual office hours did not see a lot of use by the students. The researchers expected that students would want to communicate in real-time with their peer facilitator and would utilize social media for that purpose. One of the most promising results is the overwhelming feedback from both the students and the peer facilitators regarding the timeliness of the PLSG worksheets. The learning specialists worked closely with the pre-Calculus and Calculus I professors to coordinate the worksheets and help prepare the facilitators in the material. Another promising result is that the PLSGs were able to be responsive to the needs of the students. Even though worksheets were available in the PLSGs, they often were only used as supplementary work after the students worked on actual homework problems. In addition, the PLSGs

met multiple times per week in different formats, which allowed the peer facilitators to be available to the students at times when they needed it most. In contrast, the AEWs meet only once per week and students are required to complete the worksheets. This often leaves little to no time, or desire, to work on homework problems.

Stewart, B. (2005). Using InterChemNet to promote active learning curriculum development cycles. *Dissertation Abstracts International, 65*(12), 6384.
This dissertation, completed at the University of Maine (Orono, ME) in 2004 explored a number of topics including how InterChemNet had been used to manage and evaluate the Peer-led Team Learning (PLTL) program in the general chemistry lecture course at the university. ICN was used to deliver PLTL workshops, record attendance, and evaluate student understanding of workshop content as well as monitor student attitudes. Results shows significant increases in student grades and retention rates. The analysis considered factors such as previous GPS, high school rank, and SAT scores. Student and leader attitudes towards PLTL were also documented.

Stewart, B. N., Amar, F. G., & Bruce, M. R. M. (2004). *Measuring the effect of PLTL in a large general chemistry course.* Conference Proceedings of the 227th American Chemical Society National Meeting, Anaheim, CA. For more information, contact the authors at the Department of Chemistry, University of Maine, Orono, ME 04469, mbruce@maine.edu
Peer-led Team Learning (PLTL) was used in a general chemistry course at the University of Maine. PLTL was first implemented in 2000. Research studies suggest increased student grades and retention rates. The analysis included variables of previous GPA, high school rank, and SAT scores.

Strozak, V. S. (2001). *Bringing Peer-led Team Learning to the community college: Starting a new initiative.* Conference Proceedings of the 222nd American Chemical Society National Meeting, Chicago, IL. For more information, contact the authors at the Center for Advanced Study in Education, The Graduate Center of the City University of New York, 365 Fifth Avenue, New York, NY 10016, vstrozak@gc.cuny.edu
Peer-led Team Learning (PLTL) has been used at institutions to support higher student achievement in chemistry courses. The model has been adapted for implementation at community and technical colleges. Special issues regarding implementation at two-year institutions are discussed.

Strozak, V. S. (2003). *Peer-led Team Learning: A cooperative learning strategy that works.* Conference Proceedings of the 226th American Chemical Society National Meeting, New York, NY. For more information, contact the author at the Center for Advanced Study in Education, The Graduate Center of the City University of New York, 365 Fifth Avenue, New York, NY 10016, vstrozak@gc.buny.edu
Peer-Led Team Learning (PLTL) was used with introductory chemistry courses of the City University of New York. Research studies suggest that PLTL participants earn higher quality grades (A, B, or C), reducing withdrawal rates, and effectiveness with students with low and moderate ability.

Strozak, V. S. (2003). *Peer-Led Team Learning: Research and evaluation*. Unpublished manuscript. City University of New York. New York, NY.
This article provides suggestions for evaluation of the Peer-Led Team Learning (PLTL) program. PLTL has established a separate web site that focuses on evaluation and research issues at http://pltlresearch.org

Strozak, V. S. (2004). *Peer-led Team Learning evaluation and research: Past and present.* Conference Proceedings of the 227th American Chemical Society National Meeting, Anaheim, CA. For more information, contact the author at the Center for Advanced Study in Education, The Graduate Center of the City University of New York, 365 Fifth Avenue, New York, NY 10016, vstrozak@gc.cuny.edu
Peer-led Team Learning (PLTL) was used in chemistry at the City University of New York. Analysis of a decade of data suggests the following: substantially more quality grades (A, B, C) and student attitudes.

Swarat, S., Drane, D., David, S. H., Light, G., & Pinto, L. (2004). Opening the gateway: Increasing minority student retention in introductory science courses. *Journal of College Science Teaching, 34*(1), 18-23.
The Gateway Science Workshop is a peer-facilitated, problem-focused program designed to improve student retention in the sciences. This article discusses its development, implementation, and efficacy, which is demonstrated by higher retention of workshop students in the course sequences. Evidence suggests that the program has particular benefits for minority students.

Tavera, G. (2012). *How can female students in a math workshop increase their problem-solving capabilities?* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Tavera-2012.docx
The way women perceive their surroundings plays an important role in how they behave, think, and express themselves (Belenky et al., 1986). During workshop sessions I observed different attitudes among female and male students. That is why this topic of females in mathematics caught my attention. Also, as a female, I have been through similar situations as other females in a classroom setting.

Tenney, A. (2001). *Peer-led Team Learning in general chemistry.* Conference Proceedings of the 221st American Chemical Society National Meeting, San Diego, CA. For more information, contact the authors at the Department of Chemistry, University of Portland, 5000 N. Willamette Blvd., Portland, OR 97203, tenney@up.edu
Peer-led Team Learning (PLTL) was used in entry-level courses in general, organic, and biological chemistry courses at the University of Portland.

Tenney, A., & Houck, B. (2004). Learning about leadership: Team learning's effect on peer leaders. *Journal of College Science Teaching, 33*(6), 25-29.
This articles describes the use of Peer-Led Team Learning (PLTL) to improve student learning in a chemistry course at the University of Portland, a private, comprehensive,

regional university of about 3,000 students in Oregon. The focus of this article was on research concerning the leadership development of the student peer facilitators. The student leaders reported increases in their scientific knowledge, interpersonal communication skills, teaching skills, and leadership skills.

Tenney, A. D. (2002). *What works in institutionalizing student centered teaching methods: Peer-led Team Learning.* Conference Proceedings of the 224th American Chemical Society National Meeting, Boston, MA. For more information, contact the author at the Department of Chemistry, University of Portland, 5000 N. Willamtie Blvd., Portland, OR 97203, tenney@up.edu
Peer-led Team Learning (PLTL) has been used at the University of Portland (OR) to support higher student achievement in introductory science courses since Fall 1999. PLTL has now been expanded to nine faculty members in three academic disciplines. This paper discusses the critical factors needed to implement and support the PLTL program. Preliminary studies suggest that the academic culture has been positively impacted by PLTL, especially regarding female students.

Thiry, H., Hug, S., & Barker, L. (2008). *CAHSI Year 2 annual evaluation report: Recruiting, retaining, and advancing Hispanics in computing*. University of Colorado, Bolder. Bolder, Colorado. Retrieved from www.colorado.edu/eer/downloads/CAHSIyear2Report2008.pdf
CAHSI institutions have focused their efforts on the recruitment, retention, and advancement of Hispanic computer science students. In 2007, the seven CAHSI computer science departments graduated 149 Hispanic computer science majors. Excluding the University of Puerto, Rico, Mayaguez, which is 100% Hispanic, 45% of computer science majors at CAHSI institutions were Hispanic. In addition, two CAHSI institutions graduated an above-average proportion of women in computer science. Three institutions serve other underrepresented minorities as well, specifically African-American computer science students. When compared to other Hispanic serving institutions, the enrollment of Hispanic computer science students at CAHSI institutions is closer to parity with the overall enrollment of Hispanic students at their schools. However, most CAHSI schools have opportunities for growth in this area. The Alliance has implemented multiple interventions to enhance the recruitment, retention, and advancement of Hispanic computer science students at participating institutions. The CS-0 course is intended to help CAHSI institutions recruit and retain more Hispanics into the computer science major. At every institution, the percentage of Hispanics enrolled in CS-O is higher than the percentage of Hispanics enrolled in the CS major, suggesting that CS-0 is an effective method for recruiting more Hispanics into the department. Although the recruitment, retention, and advancement of women into computing are not explicit goals of CAHSI, CS-0 has also been successful in enrolling women in CS-0. At every institution except one, the percentage of women undergraduates enrolled in CS-0 is higher than the percentage of women enrolled in the CS major. Though the CS-0 course has attracted more Hispanics and women than are presently enrolled in CAHSI computer science departments, it is too early to tell whether these students will continue in computer science. To determine the retention rate of CS-0 students, the evaluation team will track whether these students enroll in CS1 in

subsequent semesters. In addition, the enrollment of Hispanics in many CAHSI computer science departments is lower than the enrollment of Hispanics in the institution, suggesting that there is room for growth in the recruitment of Hispanics into the computer science major. The CS-0 course was successful in boosting students' confidence in their programming abilities. Students who had not programmed a computer made the greatest gains in confidence. Women gained greater confidence in computer programming than men. All racial/ethnic groups, including Hispanics, exhibited strong increases in confidence in computer programming. Indeed, the gains in computer programming confidence across all demographic variables, such as gender and ethnicity, suggest that the CS-O course served to boost the confidence of most students. Peer-Led-Team-Learning in "gatekeeper" courses aims to increase student retention in the major by providing near-peer role models to boost their confidence and knowledge. Sessions were informal and involved group work to develop relationships among students in the course, said to influence student persistence in the major. Overall, students found the PLTL sessions to be fun, interesting, and helpful. Students, particularly Hispanic students, gained confidence in their computing abilities through PLTL sessions, and leaders reported confidence gains as well. Being a peer leader increased students' communication, teaching, leadership, and interpersonal skills. Hispanics had slightly better gains in skills than other peer leaders. Students were generally confident in their skills as a peer leader, particularly in their ability to help students understan concepts, to motivate students, and to effectively communicate. Students' experiences as peer leaders also increased their aspirations to have a computing career and, to a lesser extent, their aspirations to attend graduate school in computing. Peer leading had a more positive influence on the aspirations of women and Hispanics. Being a peer leader also enhanced students' disciplinary and conceptual knowledge. In part, this increase in knowledge and confidence contributed to some students' motivation to pursue graduate studies.

Tien, L. T., Roth, V., & Kampmeier, J. A. (2002). Implementation of a Peer-Led Team Learning instructional approach in an undergraduate organic chemistry course. *Journal of Research in Science Teaching, 39*(7), 601-632.
This study focused on the use of Peer-Led Team Learning (PLTL) program for all students enrolled in an undergraduate organic chemistry course and an evaluation of student outcomes. Quantitative and qualitative data were collected. PLTL students (treatment) were compared with students who participated in recitation sessions (control). PLTL students earned higher final course grades and had higher persistence rates. Analysis of interviews with PLTL students suggested that the program helped them to learn more course material, were more socially engaged, intellectually stimulated, and found the experience to be a productive use of time.

Tien, L. T., Roth, V., & Kampmeier, J. A. (2004). A course to prepare peer leaders to implement a student-assisted learning method. *Journal of Chemical Education, 81*(9), 1313-1321.
This article describes a two-credit training program for peer student facilitators to assist other students in mastering difficult academic content material. An outline of the training curriculum is provided. Peer-led Team Learning (PLTL) utilizes the skills of trained

student paraprofessionals to help a small team of students to work through difficult problems posed by the classroom instructor. The student facilitators are cited as key in the success of PLTL with increasing student academic achievement. Comments from student peer leaders are provided to illustrate the impact of the training program on their professional development and preparation for the program. The leader training course is a collaborative effort of faculty and educational specialists to join pedagogy and chemistry. The syllabus is grounded in the research literature and situated in the context of the specific course in which the peer leaders will work, leading a weekly Workshop. Since the peer leaders take the training course while they are working as leaders, the pedagogical ideas find immediate application. The authors had taught the course since 1995 to more than 250 undergraduate and graduate students. In practice, the training course is the central mechanism to transform students from Workshop participants to skilled Workshop leaders. In turn, these carefully prepared peer leaders are essential forces for curricular change. In addition to the immediate practical benefits, the training course leads to new working relationships among students, faculty, and educational specialists. As a result, the training course becomes a mechanism to introduce current faculty to a new research literature and to encourage the development of future faculty.

Various. (2001-2010). Implementation - Starting a PLTL Program. *Progressions: The Peer-Led Team Learning Project Newsletter*. Retrieved from http://pltlis.org/resources/implementation/implementation-starting-a-pltl-program/.
A collection of short case studies for implementation of PLTL at colleges across the U.S. The articles explore the administrative issues required for starting a PLTL program.

Various. (2001-2010). Implementation - Training the student leaders in the PLTL Program. *Progressions: The Peer-Led Team Learning Project Newsletter*. Retrieved from http://pltlis.org/resources/leader-training/.
A collection of training materials for the new student PLTL leaders.

Various. (2001-2010). Sustaining a PLTL program. *Progressions: The Peer-Led Team Learning Project Newsletter*. Retrieved from http://pltlis.org/resources/sustaining-a-pltl-program-2/.
A collection of training materials for sustaining the PLTL over the long term.

Varma-Nelson, P. (2005). The Peer-Led Team Learning workshop model *Project Kaleidoscope Volume IV: What works, what matters, what lasts*. Washington, D.C.: Project Kaleidoscope
This short narrative provides an overview of the Peer-Led Team Learning (PLTL) model.

Varma-Nelson, P. (2014). IUPUI faculty and undergrad researchers evaluate Peer-led Team Learning in cyberspace. *Psys.org*, Retrieved from http://phys.org/news/2014-01-iupui-faculty-undergrad-peer-led-team.html
This online article provides an overview of an adapted use of PLTL at Indianapolis University-Purdue University Indianapolis.

Varma-Nelson, P. (n.d.). *What is PLTL?* Unpublished manuscript. Northeastern Illinois University. Chicago, IL.
This paper provides a narrative overview of the Peer-Led Team Learning (PLTL) program.

Varma-Nelson, P., & Coppola, B. P. (2005). Team learning. In M. M. Cooper, T. Greenbowe & N. Pienta (Eds.), *The chemists' guide to effective teaching*. Upper Saddle River, NJ: Prentice Hall

Varma-Nelson, P., & Cracolice, M. S. (Eds.). (2001). *Peer-Led Team Learning: General organic and biological chemistry*. Upper Saddle River, NJ: Prentice Hall
This book provides strategies for implementing the Peer-Led Team Learning (PLTL) program by other educators in a general organic and biological chemistry course.

Varma-Nelson, P., Cracolice, M. S., & Gosser, D. K. (2003). Peer-Led Team Learning: A student-faculty partnership for transforming the learning environment *Invention and impact: Building excellence in undergraduate science, technology, engineering, and mathematics (STEM) education* (pp. 43-48). Washington, D.C.: American Association for the Advancement of Science
This chapter describes the use of the Peer-Led Team Learning (PLTL) program in science courses to increase their academic success. After providing an overview of the PLTL program, effects on the peer leaders are presented along with a report of the national dissemination of the model.

Varma-Nelson, P., & Gosser, D. (2005). Dissemination of Peer-led Team Learning (PLTL) and formation of a national network: Embracing a common pedagogy. In M. Ouellet (Ed.), *Teaching inclusively: Diversity and faculty development* (pp. 503-518). Stillwater, OK: New Forums Press

Varma-Nelson, P., & Gosser, D. K. (2000). *National dissemination of the workshop project: Peer-led Team Learning.* Conference Proceedings of the 219st American Chemical Society National Meeting, San Francisco, CA. For more information, contact the authors at the Science Department, St. Xavier University, 3700 West 103rd Street, Chicago, IL 60653, varmanelson@sxu.edu
Peer-led Team Learning (PLTL) is used at the St. Xavier University in chemistry courses. The national PLTL dissemination efforts are reviewed.

Varma-Nelson, P., & Gosser, D. K. (2001). *National dissemination of Peer-led Team Learning: Its design, implementation, documentation, and evaluation.* Conference Proceedings of the 222nd American Chemical Society National Meeting, Chicago, IL. For more information, contact the authors at the Science Department, St. Xavier University, 3700 West 103rd Street, Chicago, IL 60655, varmanelson@sxu.edu
Peer-led Team Learning (PLTL) has been used at more than 100 institutions to support higher student achievement in an organic chemistry course. National data studies as well as recommendations for successful implementation are shared.

Varma-Nelson. P. (1997). *Workshop chemistry: Peer-led Team Learning.* Conference Proceedings of the 214th American Chemical Society National Meeting, Las Vegas, NV. For more information, contact the author at the Science Department, St. Xavier University, 3700 W. 103rd St., Chicago, IL 60655
Peer-led Team Learning (PLTL) was used with undergraduate chemistry students to improve instruction. Preliminary evaluation studies suggest improved student learning, teamwork skills, and communication skills..

Varma-Nelson. P., & Cracolice, M. S. (1998). *Workshop chemistry: Peer-led Team Learning.* Conference Proceedings of the 216th American Chemical Society National Meeting, Boston, MA. For more information, contact the author at the Science Department, St. Xavier University, 3700 W. 103rd St., Chicago, IL 60655
Peer-led Team Learning (PLTL) was used with undergraduate chemistry students to improve instruction. Preliminary evaluation studies suggest improved student learning, higher persistence rates, improved teamwork skills, and heightened communication skills..

Vaughan, J. (2009). My experience as a Peer Leader: Insight hindsight.. Peer-Led Team Learning: The experience of leading. *Progressions: The Peer-Led Team Learning Project Newsletter, 10*(2). Retrieved from http://pltlis.org/wp-content/uploads/2012/10/Experience-of-Leading-Vaughn-My-Experience-as-a-Peer-Leader.pdf.
This report is based on first-hand account by a student facilitator involved with the Peer-led Team Learning (PLTL) program. Some of my favorite memories over the last four years at The City College of New York of the City University of New York were not of me at a desk, listening intently about the mysteries of the known universe. Rather, my finest memories involved me in a workshop, at a chalkboard, using wit and comedic humor to clarify a topic that was introduced by a 'boring' professor not more than an hour prior.

Villatoro, M. L., Moreira, M., & Liang, Y. (2012). *Successful implementation of PLTL for the Department of Construction Management and Civil Engineering Technology (CMCE) of New York City College of Technology* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Villatoro-2012.docx
Peer Led Team Learning (PLTL) involves students working in small groups under the guidance of a Peer leader. Peer Leaders are current students who have successfully completed the course. The goal of PLTL is to enable students to gain confidence and critical problem solving skills that will help them master the course content thereby improving their ability to succeed in successive design courses. PLTL is currently in its first semester of implementation and data indicates that the students in the PLTL inclusive Statics classes are performing better than those in sections without PLTL.

Wamser, C. C. (2004). *PLTL and student success in organic chemistry.* Conference Proceedings of the 227th American Chemical Society National Meeting, Anaheim, CA. For more information, contact the author at the Department of Chemistry, Portland State University, Portland, OR 97207, wamserc@pdx.edu
Peer-led Team Learning (PLTL) was used in chemistry at Portland State University (OR). PLTL is an optional one-credit, two=hour weekly course that attracts about 30% of the students to enroll. Student outcomes for the participants include: slightly higher GPA based on all courses taken, higher persistence rates, and improved attitudes. Positive differences were greater than can be attributed to differences in entry GPA.

Wamser, C. C. (2006). Peer-Led Team Learning (PLTL) in organic chemistry: Effects on student performance, success, and persistence in the course. *Journal of Chemical Education, 83*(10), 1562-1566.
This paper describes the results of instituting Peer-led Team Learning (PLTL) for the first two years of chemistry (general chemistry and organic chemistry). Data was collected for the past five years. Students who elected to take the workshops had a somewhat higher overall grade point average based on all courses taken (3.26 vs 3.14). However, the gains of the PLTL students in each category: success rate (85% vs. 69%), three-term persistence (57% vs. 28%), and course performance (71% vs. 65%), course GPAS (2.90 vs. 2.51), and ACS exam scores (77th vs. 69th percentile) were all significantly higher than can be attributed solely to differences in student GPA.

Wang, B. (2010). From Peer-Led Team Learning to professional work experiences. Peer-Led Team Learning: The experience of leading. *Progressions: The Peer-Led Team Learning Project Newsletter, 12*(1). Retrieved from http://pltlis.org/wp-content/uploads/2012/10/Experience-of-Leading-Wang-PLTL-to-Professional-Experience.pdf.
The author relates their personal story of how serving as a student facilitator of the Peer-led Team Learning (PLTL) program had benefits for himself as well as for the participating students. Some of those new sills were: improved problem-solving skills, increased interpersonal communication skills, and deeper understanding of the course material that benefited degrees in Computer Science (CS) and obtained employment as a Tech Analyst at JPMorgan Chase.

Willoughby, L. J. (2004). *The effect of an enriched learning community on success and retention in chemistry courses.* (Ph.D. dissertation), Florida International University, Miami, FL.
This dissertation study examined a variety of factors including Peer-led Team Learning (PLTL) and their impact on success success within a chemistry course. The students studied were an existing learning community of science, mathematics, and engineering majors. During the two years the learning community project has existed, success, retention, and next-course continuation rates were higher than in traditional coures. Faculty and student interviews indicated there were many affective accomplishments as well. Substantial differences were found in comparing the learning community and the traditional course students in the following areas: perceptions about the lecture, lab, and other supported used for the course; contact with other students, helping them reach

their potential; and student recommendations about the course that they give to others. Because of the limitation of small sample size, these differences were reported in descriptive terms. Success and retention rates for the two student groups were collected and analyzed. No statistically significant differences were found between the two groups.

Woodward, A., Gosser, D., & Weiner, M. (1993). Problem-solving workshops in general chemistry. *Journal of Chemical Education, 70*, 651-665.

Yanez, D., Saupe, G., & Becvar, J. E. (2012). *Let my people go.* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Yanez-2012.docx
Motivating students to study and learn chemistry is difficult especially as the semester progresses and more and more abstract concepts are introduced. Peer-Led Workshops have many types of students: some students are independent learners that don't need extra help; many students, however, benefit significantly from closer to one-on-one attention. This latter category of student often has a tendency simply to become overwhelmed without extra assistance and then to give up. Peer-Led Team Learning at UTEP offers strategies to reach those students in need of significant help.One of them is the "Let my People Go" incentive that offers all students in Workshop the opportunity to leave early (e.g. 20 minutes early from the two-hour workshop) if they demonstrate understanding of the concepts for the week.After the independent or successful learners have departed, the peer leader can focus on and personally assist the "Lost Sheep": those students in greater need of the one-on-one problem-solving attention.

Yuanyuan Kang, L. M., Mitsue Nakamura. (2012). *Implementation of PLTL in a freshman biology course at The University of Houston-Downtown.* Conference Proceedings of the The Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Kang-2012.docx
At the University of Houston-Downtown, we take pride in providing students with a faculty-intensive approach to high quality higher education in science, technology, engineering, and mathematics (STEM). As part of an UHD initiative to improve student retention and performance, we started a project to implement PLTL workshops within one freshman General Biology I course. Here, we present our initial efforts in this project and preliminary data on its effectiveness beginning in the Spring 2011 Semester. According to our data, there was an increased performance (20%) among the students who attended workshops compared to the class average and a decrease (20%) in withdrawal and failing. However, we also faced challenges in certain areas such as the lack of biology peer leaders. We will discuss these issues and the strategies we took to address them.

Zonoozi, F., Narayan, M., & Becvar, J. E. (2012). *Foundation of the leaders, by the leaders, and for the leaders.* Conference Proceedings of the The Peer-led Team

Learning International Society Inaugural Conference, Brooklyn, NY. Retrieved from http://pltlis.org/wp-content/uploads/2012%20Proceedings/Zonoozi-2012.docx
Funding Peer-Led Team Learning (PLTL) initiatives after the grants run out has been a long-standing and often devastating issue within the greater PLTL world. We propose consideration of local independent nonprofit organizations (Local Foundations) or possibly Local Chapters within PLTLIS to advance Science, Technology, Engineering, and, Mathematics (STEM) education through the PLTL model. The proposed Foundations are envisioned as collaborations of: Academics; Industry leaders; University Students; Members of the local education district; and High School teachers to be run and funded locally from the ground up rather than from top down. This will give the Leaders and those directly interacting with them more opportunity to govern their own path without university encumbrances, such as Development Office, Administration, or System/University/College politics, restrictions and fees. The purpose of the Foundations is to provide K – 16 pupils with the requisite skills to enter and succeed in higher education STEM (or any other) disciplines. The function includes aiding instructors in the K – 12 realm to enable students toward successful transition to higher education. Independent foundations organized and overseen by the Leaders can promote PLTL using outstanding students from Universities/Colleges, High Schools and Community Colleges. Foundations can seek funding from local and federal government entities, individuals and most importantly businesses/industries and other philanthropic organizations.

Zurer, P. S. (2001). Teaching organic chemistry. *Chemical & Engineering News, 79*(16), 43-45.
This article describes the use of Peer-led Team Learning (PLTL) workshops in an organic chemistry course at the University of Rochester-New York.

Structured Learning Assistance (SLA)

Initiated in 1994 at Ferris State University (OH), Structured Learning Assistance (SLA) workshops assist students in developing the background needed to connect to the course content and to develop and apply the learning strategies most appropriate to the content area. All students in the targeted classes are required to attend the sessions until they demonstrate content mastery by high marks on units exams. Attendance becomes optional for these students and continues to be mandatory for others. A faculty development component is also part of SLA which supports higher academic achievement for students. SLA has been recognized through several national awards and is currently supported by a USDOE Grant from the Fund for the Improvement of Postsecondary Education. Results indicated that SLA can significantly improve student pass rates, even for at-risk students. The national office for SLA can be accessed at http://www.ferris.edu/htmls/academics/sla/

Arendale, D. R. (2004). Pathways of persistence: A review of postsecondary peer cooperative learning programs. In I. M. Duranczyk, J. L. Higbee & D. B. Lundell (Eds.), *Best practices for access and retention in higher education* (pp. 27-42). Minneapolis, MN: Center for Research on Developmental Education, General College, University of Minnesota.Retrieved from http://education.umn.edu/CRDEUL/monographs.html.
This chapter focused intentionally on a subset of the educational practice that share a common focus with increasing student persistence towards graduation. Rather than a meta-analysis of all published research studies, this chapter is a preliminary review and a description of six models. At the end of the chapter several suggestions are made for differentiating the models from each other and the level of institutional resources and resolve with implementing them. The six student peer learning programs included in this chapter meet the following characteristics: (a) the program must have been implemented at the postsecondary or tertiary level, (b) the program has a clear set of systematic procedures for its implementation at an institution, (c) program evaluation studies have been conducted and are available for review, (d) the program intentionally embeds learning strategy practice along with review of the academic content material, (e) the program outcomes include both increased content knowledge with higher persistence rates, and (f) the program has been replicated at another institution with similar positive student outcomes. From a review of the professional literature six programs emerged: Accelerated Learning Groups (ALGs), Emerging Scholars Program (ESP), Peer-Led Team Learning (PLTL), Structured Learning Assistance (SLA), Supplemental Instruction (SI), and Video-based Supplemental Instruction (VSI). As will be described in the following narrative, some of the programs share common history and seek to improve upon previous practices. Other programs were developed independently.

Arendale, D. R. (2009). Course-based Learning Assistance (CLA) program guide. In S. Clark-Thayer & L. P. Cole (Eds.), *NADE self-evaluation guides: Best practice in academic support programs* (2nd ed., pp. 105-138). Clearwater, FL: H&H Publishing.
These program standards provide guidance for management of postsecondary peer cooperative learning programs such as Supplemental Instruction (SI), Structured Learning Assistance (SLA), Emerging Scholars Program (ESP), Peer Assisted Learning

Program (PAL), and Peer-led Team Learning (PLTL). These standards were developed through extensive field testing of professionals in the field operating these peer learning programs. There are six sections to the chapter: mission and goals; assessment and evaluation; program design and activities; human resources; and value system. The items within each section are divided between essential (important for any peer learning program) and recommended (useful for some peer learning programs due to their design). A more detailed examination of assessment and evaluation of peer learning programs is provided elsewhere in the larger publication.

Arendale, D. R. (2009). Specific assessment and evaluation protocols for Course-based Learning Assistance (CLA) programs. In S. Clark-Thayer & L. P. Cole (Eds.), *NADE self-evaluation guides: Best practice in academic support programs* (2nd ed., pp. 183-193). Clearwater, FL: H&H Publishing.
These program standards provide guidance for assessment and evaluation of postsecondary peer cooperative learning programs such as Supplemental Instruction (SI), Structured Learning Assistance (SLA), Emerging Scholars Program (ESP), Accelerated Learning Groups (ALGs), Video-based Supplemental Instruction (VSI), and Peer-led Team Learning (PLTL). These standards were developed through extensive field testing of professionals in the field operating these peer learning programs. There are four progressive levels of assessment and evaluation: program activity reports, immediate outcomes, short-term outcomes, and longer-term outcomes. The levels within each section are divided among questions to investigate, data needed for collection for analysis, and finally, analysis procedures. Depending on the particular peer learning program, some of these protocols would be more appropriate than others. A more detailed examination of mission, program design, administration, and other issues related to implementation of peer learning programs is provided elsewhere in the larger publication.

Doyle, T. (1999). Ferris State University's structured learning assistance program. *Michigan Developmental Educational Consortium Newsletter*, 4-5, 8.
This newsletter article describes a learning model at Ferris State University. The Structured Learning Assistance Program (SLA) provides both an academic and an affective support system. SLA targets both high-risk for failure gateway and historically difficult upper division courses with four-hour per-week directed practice workshops. The SLA workshops are formally scheduled in the student schedule just like an accompanying science lab. Attendance at the workshop is required of all students the first week of the course or until the first test, quiz or other assessment is given in the class. Following the assessment, attendance is required only for students whose course grade point average falls below a 2.0 Other students may voluntarily continue to attend the SLA sessions. In addition to traditional SI program features, class professors receive regular, ongoing information about student progress, student concerns, and ways of better connecting with students. SLA sessions provide more explicit instruction in learning strategies. Research studies suggest that SLA students earn higher final course grades than nonparticipants in control groups.

Doyle, T., & Hooper, J. (1997). *Structured Learning Assistance Project. Final Report, Fall Semester 1996, Winter Semester 1997*. Unpublished manuscript. Ferris State University. Big Rapids, MI. Retrieved from ERIC database. (ED425772)
Initiated in 1994, Structured Learning Assistance (SLA) is a research project whose purpose is to determine if, for certain courses, grades can be improved by requiring students to attend weekly practice workshops. These SLA workshops assist students in developing the background needed to connect to the course content and to develop and apply the learning strategies most appropriate to the content area. This report details the 3-year findings of the SLA project, as well as findings for all students who participated in it during the 1996-1997 academic year, with a focus on minority students. Results indicated that SLA can significantly improve student pass rates, even for at-risk students. In nearly 85% of the 42 courses offered with SLA support, the SLA students had higher pass rates than those of all other university students taking the same courses. This improvement was especially marked in the mathematics courses, where the average pass rate increased anywhere from 24 to 45 percent. Student evaluations of the SLA project are included. Appended are minority and total student data for fall 1996 and winter 1997, statistics on the project's 3-year averages, and pass rate by subject area.

Doyle, T., & Kowalczyk, J. (1999). *The Structured Learning Assistance Program model.* Conference Proceedings of the National Association for Developmental Education, Detroit, MI. Retrieved from http://www.nade.net/documents/SCP99/SCP99.2.pdf
Structured Learning Assistance (SLA) was developed at Ferris State University (OH) to meet the need of challenging 100- through 400-level courses. SLA is an in-course student community that is directly attached to courses. The article provides background to the SLA model. Data suggests the following outcomes for the SLA program: higher rates of earning C- or better in the course, higher persistence rate at the institution, and 73% of students attributed SLA as significant to their academic achievement.

Garcia, B. (2004, 2004, February 18). The 11th anniversary of SLA, *Torch*.
This newspaper article recounts the history of Structured Learning Assistance (SLA) at Ferris State University. It provides interviews with creators of the program along with the early history of SLA.

Morton, A. M. (2006). Improving NCLEX scores with Structured Learning Assistance. *Nurse Educator, 31*(4), 163-165. Retrieved from http://journals.lww.com/cinjournal/Fulltext/2008/09001/Improving_NCLEX_Scores_With_Structured_Learning.19.aspx.
This article describes the use of Structured Learning Assistance (SLA) with improving NCLEX scores for nursing students at Ferris State University (MI). SLA is attached to the nursing pharmacology course offered the first clinical semester and the three medical/surgical nursing courses offered the second, third, and fourth clinical semesters. Studies show that students obtaining higher course grades earn higher pass rates on the NCLEX examination (improved from 65% to 92%).

Staff. (2005). Structured Learning Assistance Homepage of Work. of Work. Department. Retrieved from http://www.ferris.edu/sla/
This is the web homepage for Structured Learning Assistance based at Ferris State College in Michigan. A variety of descriptive information, evaluation studies, and training materials are available.

Stern, C. (1996). Structured Learning Assistance in the basic writing class. In D. C. Mollise & C. T. Matthews (Eds.), *Selected conference papers, volume 2, 20th annual conference of the National Association for Developmental Education* (pp. 39-41). Little Rock, AR: National Association for Developmental Education
This paper provides an overview of the Structured Learning Assistance (SLA) program and its use in a basic writing class at Ferris State College in Michigan.

Supplemental Instruction (SI)

The Supplemental Instruction (SI) model of academic assistance helps students in historically difficult classes master content while they develop and integrate learning and study strategies. The program was originally developed at the University of Missouri-Kansas City in 1973 and has been adopted by hundreds of institutions in the U.S. and abroad. 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 participate. There is no stigma attached to SI since *historically difficult courses* rather than *high risk students* are targeted. SI is scalable and can be implemented in one or more courses each academic term. The International Center for SI can be accessed at http://www.umkc.edu/asm/si/ National Centers have been established in Australia, Canada, Republic of South Africa, Sweden, and United Kingdom. Their websites are included in the citations for this section of the bibliography.

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*.

Adams, J. (2011). *The relationship between Supplemental Instruction leader learning style and study session design.* (Ed. D. dissertation), University of North Texas, Texas. The purpose of this qualitative study was to examine the learning styles of Supplemental Instruction leaders at a large, public university during the fall 2010 semester and determine whether or not their personal learning styles influenced the way they designed and developed out-of-class study sessions. The total population of Supplemental Instruction leaders was 37, of which 24 were eligible to participate in the study. Of the 24 eligible supplemental instruction leaders, 20 completed the entire study. Participants in the study included nine male and 11 female supplemental instruction leaders with a median age of 22.25 years-old. Seventeen participants indicated their classification as senior, two as junior, and one as sophomore. Of the participants, 16 indicated white as a race or ethnicity, one indicated Asian, two indicated African American, and one indicated both American Indian/Alaska Native and white. Supplemental instruction leader learning style was assessed using the Kolb Learning Style Inventory. Leaders were then interviewed, and their study sessions were analyzed. Through triangulation of data from learning style, interviews and actual study session documents, four major themes emerged. The four themes were: 1) incorporation of personal experience into study session design, 2) the sense of impact on student learning, 3) a feeling of the need to incorporate varied activities into study session design, and 4) the concept that students must take ownership over their own learning. No consistent pattern emerged among the themes; however, the results attributed out-of-class study session design to both the incorporation of personal learning style preferences as identified through the Kolb Learning Style Inventory and training conducted by the institution. Implications for future research include the need for continued research addressing how and if Supplemental Instruction leader learning style influences out-of-class study session design. Also, as institutions of higher education seek to expand academic support services to all students, future research should explore Supplemental Instruction leader training and the impact such training has on students seeking support from the Supplemental Instruction program.

Ahrens, R., George, B., Henderson, A., Marhinin, N., Power, D., & Rae, M. (1996). *Students helping students: Peer Assisted Study Sessions for students enrolled in a science content subject*. Paper presented at the 2nd State Conference of HERDSA, University of Southern Queensland, Toowoomba, Queensland, Australia.
The Peer Assisted Study Sessions (PASS) program, based upon the Supplemental Instruction (SI) program, was used at the Queensland University of Technology (Brisbane, Australia) in the Center for Mathematics and Science Education. Students enrolled in the Primary and Early Childhood area of a Bachelor of Education degree must take Science Foundations (MDB303) in their first year. The formal science backgrounds of many students enrolled in this class are inadequate. This study examined students enrolled in the class during 1995. The PASS group received higher final course grades (4.88 vs. 4.15, 0 to 7 scale) than the non-PASS participants. Qualitative research through student interviews and analysis of surveys suggested improvement gains for the PASS group as well.

Ainsworth, L., Garnett, D., Phelps, D., Shannon, S., & Ripperger-Suhler, K. (1994). *Mathematics: Needs and approaches using Supplemental Instruction*. Unpublished manuscript. Texas Tech University at Lubbock.
This paper discusses the implementation of Supplemental Instruction (SI) at Texas Tech University (Lubbock, TX) with courses in mathematics. After a review of the literature regarding the challenges with academic achievement for students in mathematics, the authors provide suggestions on how to successfully implement a SI program: focusing on problem-solving activities in the SI sessions that clearly illustrate the protocols to solve the problems rather than focusing just on finding the correct answer; providing more structure to SI sessions in math in comparison with SI sessions in other academic disciplines; and working on developing correct use of math vocabulary.

Ainsworth, L., Garnett, D., Phelps, D., Shannon, S., & Ripperger-Suhler, K. (1994). Steps in starting Supplemental Instruction. In D. C. Martin & D. Arendale (Eds.),

Supplemental Instruction: Increasing achievement and retention (pp. 23-30). New Directions for Teaching and Learning No. 60. San Francisco, CA: Jossey-Bass, Inc.
An institution must complete a number of critical steps to effectively implement a new Supplemental Instruction (SI) program: present research-based information that suggests the effectiveness of SI; gaining administrative and faculty support; selecting a SI supervisor with sufficient release time; carefully supervising the SI program throughout the academic term; and using evaluation data for program improvement. The authors based their suggestions from past experience at Texas Tech University.

Akao, S. E. (1996). Book review of Supplemental Instruction: Increasing achievement and retention. *Journal of College Student Personnel, 37*(3), 360.
This is a book review of the monograph Supplemental Instruction: Increasing achievement and retention (Martin and Arendale, Editors, 1994). The book review provides a short summary of each of the monograph's chapters.

Allen, A., & Court, S. (2009). Leader self disclosure within PAL: A case study. *Australasian Journal of Peer Learning, 2*(1), 68-86. Retrieved from http://ro.uow.edu.au/ajpl/vol2/iss1/1.
Peer Assisted Learning (PAL) is a variant of the Supplemental Instruction (SI) program. The PAL leaders were the subject of this study at Bournemouth University in England. The issue under investigation was self disclosure of the PAL leaders within the learning environment and the impact on students. Qualitative and quantitative methods were used to gain insight about the levels and nature of PAL leader self-disclosure during PAL sessions. Results show that 46% are open with their feelings and 84% often use personal examples within a PAL session. Qualitative methodology identified the types of ways disclosure was used to build trust with students and illustrate what the PAL leader was trying to communicate.

Allen, M., Kolpas, S., & Stathis, P. (1992). Supplemental Instruction in calculus at a community college. *Collaborative Learning Exchange Newsletter*, 8-9.
At Glendale Community College (Glendale, CA) an experiment was conducted in several calculus courses regarding optional and mandatory attendance. In the traditional SI model attendance in SI is optional and anonymous. In the classes where mandatory attendance was required, students received a 10 percent boost in their grade for participating and submitting additional homework assignments. SI participants earned a mean final course grade that was 20 percentage points higher (70 percentile vs. 50 percentile). In another experiment SI session strategies were integrated into the class sessions. The class instructor developed the work sheets used in the SI sessions. The students in the modified course were compared to classes where SI sessions were not integrated into them. The SI participants earned a mean final course grade nearly a full-letter grade higher than the other students. While initial comments from SI participants were negative, by the end of the term the comments were highly supportive of the SI program.

Anderson, P. (2014). *The impact of Supplemental Instruction on student success and retention of students at a university in North Carolina.* (Ph.D. dissertation), Liberty

University, Lynchburg, VA. Retrieved from http://digitalcommons.liberty.edu/cgi/viewcontent.cgi?article=1879&context=doctoral
This study measured to what extent there is a statistical difference in cumulative GPA, course grade and retention rate between first and second year students who attended Criminal Justice and Philosophy Supplemental Instruction sessions, and students in Criminal Justice and Philosophy who did not attend Supplemental Instruction sessions. In this causal-comparative research study, the researcher analyzed a cause-and-effect relationship including the independent variables of Supplemental Instruction attendanc and the course. The dependent variables were the students' cumulative GPAs, final course grades and retention. The researcher divided students into six different but not mutually exclusive groups as follows: students enrolled in Introduction to Criminal Justice who attended Supplemental Instruction, students enrolled in Introduction to Criminal Justice who did not attend Supplemental Instruction, students enrolled in Introduction to Philosophy who attended Supplemental Instruction, students enrolled in Introduction to Philosophy who did not attend Supplemental Instruction, students enrolled in either Criminal Justice or Philosophy who attended any Supplemental Instruction, and students enrolled in either Criminal Justice or Philosophy who did not attend any Supplemental Instruction at a university in southeastern North Carolina. The results of this study showed that students who participated in SI sessions had better outcomes than those students who did not participate in SI sessions with regards to cumulative GPA, course grade, and retention With the exception of one hypothesis test, all of the remaining seven hypothesis tests rejected the null hypothesis of no difference between SI participation groups.

Andersson, A. (1996). *Supplemental Instruction in Mechanics A*. Unpublished manuscript. The Lund Institute of Technology. Lund, Sweden.
This report describes the use of Supplemental Instruction (SI) in the Mechanics A course during spring of 1996 in the School of Mechanical Engineering at the Lund Institute of Technology (Sweden). The author was the SI leader for the course. The report provides a description of events that occurred during the SI sessions throughout the academic term. Suggestions from the SI leader included: be careful to schedule SI sessions at times of highest interest for the students; keep to time commitments when to start and finish SI sessions since students may have other appointments following the sessions; divide the SI participants into smaller groups so maximize student discussions; and make sure that the SI leader has a plan before the beginning of the session to provide structure.

Angrist, J., Lang, D., & Oreopoulos, P. (2006). *Lead them to water and pay them to drink: An experiment with services and incentives for college achievement*. (Report). Retrieved from National Bureau of Economic Research website: http://papers.nber.org/papers/w12790.pdf
This project was sponsored by the Canada Millennium Scholarship Foundation. This paper reports on a randomized field experiment involving two strategies designed to improve college academic outcomes among first-year undergraduates at a large Canadian university. One treatment group was offered peer advising and tutorial services. The students participated in a version of Supplemental Instruction (SI).

Another was offered substantial merit-scholarships for solid, but not necessarily top, first year grades. A third treatment group combined both interventions. The financial incentive encouraged more students to participate in SI. While male students did not see much improvement of grades, females did. Females who participated in the SI program and received the financial incentive for the scholarships persisted longer at the institution. The researchers suggest that a combination of the academic intervention and the scholarship program was the most effective way to increase academic performance and student persistence towards graduation.

Anker, E. O. (1991). *Supplemental Instruction: An answer for the at-risk student in a high-risk course?* (Master of Arts thesis), Calvin College, Grand Rapids, MI.
This research paper studied the use of Supplemental Instruction (SI) during Spring 1991 at Calvin College in Grand Rapids, MI. Areas for study included: final course grades for "at risk" students; and relationships among the level of SI attendance, academic ability, and final course grades. Special admit "at risk" students were the focus of the study. A study skills class was paired with a content course (e.g., History 101) in Fall 1990 to provide academic assistance for students. The at risk students were required to enroll in the non-credit course. Thirteen special admit students from Fall 1990 were enrolled in the paired class. In Spring 1991 seven special admit students instead participated in SI rather than being enrolled in a paired study skills class. There was no significant difference regarding final course grades. Individual SI attendance for SI ranged from three to 17 for the 18 sessions offered during Spring 1991. The mean average was 8.7 sessions. There was a positive correlation between higher levels of attendance and higher academic achievement. The researcher suggested that SI was more helpful to participating students than a paired study skills course.

Anton, H. F., Dooley, J. L., & Meadows, D. C. (1998). *Developmental educators as Supplemental Instruction providers: The next step.* Conference Proceedings of the National Association for Developmental Education Annual Conference, Atlanta, GA.
This conference abstract describes the use of Supplemental Instruction (SI) as a natural outgrowth of a developmental studies process. The Developmental Studies Department at Middle Tennessee State University funded an SI pilot in the 1997 Spring semester in Anatomy and Physiology. Analysis of final course grades revealed the following: the failure rate dropped from 47% to 28.6%; course grade average was 2.4 for SI participants and 1.5 for non-participants; positive correlation between higher levels of SI attendance and higher final course grades. SI was viewed as a natural compliment of other activities and services offered by the department.

Arendale, D. R. (1993). *Fostering multicultural education with a learning assistance model that works: Supplemental Instruction*. Unpublished manuscript. The University of Missouri-Kansas City. Kansas City, MO. Retrieved from
https://netfiles.umn.edu/users/arend011/www/peer/SIMULTX.pdf
This paper describes the use of Supplemental Instruction (SI) to serve as a part of a campus multicultural education program. Since the primary focus of SI sessions is on the academic content, the sessions attract students of different ethnicities and cultures who share a common concern for improving their personal academic performance in the

course. Cultural differences naturally emerge as students deal with the common academic task and they share their perspectives concerning the academic material from their personal and cultural point of view. The small group allows students to see a multiplicity of realities concerning the academic content. Some researchers argue that collaborative learning environments -- such as provided through SI sessions -- are more conducive for learning of students from diverse cultures. This is because some are field sensitive learners and find the traditional classroom environment of abstract learning unhelpful and find opportunity during SI sessions to make connections between the course material and their personal frame of reference. Included in the article is a research study directed by May Garland and partially funded by the National Association for Developmental Education. The study included 3 institutions across the U.S. regarding academic performance of students separated by ethnicity. Students of color participated at rates equal to or exceeded rates of White students in SI sessions. Students of color who participated in SI received mean higher final course grades than students of color who chose not to participate. The results were the same regardless whether the group was all students, top quartile, and bottom quartile.

Arendale, D. R. (1993). Supplemental Instruction: Improving student performance and reducing attrition *Educational Programs that Work: The Catalogue of the National Diffusion Network* (19th ed., pp. 14.14). Longmont, CO: Sopris West, Inc.
This overview of the Supplemental Instruction (SI) program provides a narrative description of SI, minimum requirements for successful implementation of the program, and services that the National Center for SI at the University of Missouri-Kansas City can provide to institutions that wish to implement SI.

Arendale, D. R. (1994, 1994). *Supplemental Instruction: Providing academic assistance at small colleges.* Conference Proceedings of the The Freshman Year Experience 7th Annual Conference for Small Campuses Conference, Minneapolis, MN. (ERIC Document Reproduction Service No. ED374765)
This paper describes the use of Supplemental Instruction (SI) in small colleges to provide academic support.

Arendale, D. R. (1994). *Understanding the Supplemental Instruction model*. New Directions for Teaching and Learning No. 60. San Francisco, CA: Jossey-Bass Publishers. Retrieved from
https://netfiles.umn.edu/users/arend011/www/peer/SIoverview94.pdf
This chapter provides a basic overview of the Supplemental Instruction model: common factors in student attrition; development of the SI program in 1973; key SI program personnel; administration and funding of SI programs; connection of the SI program with other campus programs

Arendale, D. R. (1995). Internet homepage for the National Center for Supplemental Instruction [Editor].Retrieved from http://www.umkc.edu/cad/si/
This Internet homepage maintained by the National Center for Supplemental Instruction at the University of Missouri-Kansas City provides a central location for information about SI. Some of the menu items include: overview of SI; links to homepages of SI

leaders at UMKC; information about upcoming SI Supervisor training workshops; instructions on how to subscribe to the SI listserv discussion group; SI materials for sale; directory of known SI homepages from other colleges around the world; and a directory of SI-related documents. Currently more than 100 documents are available for viewing at this site about SI by authors at UMKC and elsewhere.

Arendale, D. R. (1995). Self-assessment for adjunct instructional programs. In S. Clark-Thayer (Ed.), *NADE Self-Evaluation Guides: Models for assessing learning assistance/developmental education programs* (pp. 49-87). Clearwater, FL: H&H Publishing Company
This chapter provides a framework for evaluating a campus Supplemental Instruction (SI) program regarding a variety of issues: mission, goals, and objectives; program activities; program administration; human resources; facilities; value system; awareness of individual differences; and program evaluation. Adjunct instructional programs (AIPs) are defined as those forms of group collaborative learning assistance that accompany a specific targeted course to serve as a supplement for that course. These AIP activities occur outside of class.

Arendale, D. R. (1995). *Supplemental Instruction Internet computer discussion listserv*. Moderator. The University of Missouri-Kansas, Center for Supplemental Instruction. Kansas City, MO. Retrieved from http://www.umkc.edu/cad/si/
This moderated computer discussion listserv is provided by the National Center for Supplemental Instruction (SI). Discussion topics include: customizing SI for different content areas; strategies to increase SI attendance; methods to conduct qualitative and quantitative research; and other topics. Subscription to the listserv and is free to anyone, regardless of whether they have an active SI program or not. SI Leaders as well as SI Supervisors are especially invited to join the list. Approximately 350 persons from several countries are members of the listserv. To subscribe to the listserv, send an E-mail message to listserv@listserv.umkc.edu. In body of the message type: subscribe SInet yourfirstname yourlastname. For more information on SInet, send message to: SInet-Request@listserv.umkc.edu

Arendale, D. R. (1996). *Front loaded academic support: Supplemental Instruction in two-year colleges*. Unpublished manuscript. The University of Missouri-Kansas City. Kansas City, MO. Retrieved from https://netfiles.umn.edu/users/arend011/www/peer/SI2YR.pdf
This paper describes the role of Supplemental Instruction (SI) in providing academic support for new students in two-year colleges. Included are both interviews with campus SI Supervisors at two-year institutions across the U.S. and a data study of SI at 59 two-year public institutions that offered SI in 480 courses with an enrollment of 23,979 students. The data suggests that SI participants earn a final course grade that is half a letter grade higher than non-participants. In addition to examining the data in aggregate, similar findings occur when the data is separated by academic disciplines.

Arendale, D. R. (1996). Lessons that I have learned from students in peer study groups. *National Association for Developmental Education Newsletter, 20*(1), 1-3. Retrieved from https://netfiles.umn.edu/xythoswfs/webview/_xy-15902972_1.
Based on comments from Supplemental Instruction leaders and participants, this newsletter article describes six lessons learned by the author in his role as a course lecturer: 1) student-led discussions are needed to make lectures and reading assignments more valuable to students; 2) sometimes the lecturer spends too much time telling and not enough time modeling the thinking process for finding the answers and developing critical thinking abilities; 3) the lecturer needs to be careful not to by accident intimidate students; 4) only through student discussions will many be able to construct and retain the knowledge from the class; 5) the lecturer needs to frequently seek student feedback to improve my classroom instruction; and 6) there is more to learn at college than what happens in class.

Arendale, D. R. (1997). *Suggestions for improving attendance in Supplemental Instruction sessions*. Unpublished manuscript. The University of Missouri-Kansas City. Kansas City, MO. Retrieved from
https://netfiles.umn.edu/users/arend011/www/peer/SIattendance00.pdf
This paper is a collection of suggestions developed at the University of Missouri-Kansas City and others in the field on how to increase attendance by students at Supplemental Instruction (SI) sessions. Because of the voluntary nature of SI attendance outside of course lectures, the issue of SI session attendance will be a continuing issue. A variety of factors can influence attendance. The paper provides 27 suggestions for: activities before the beginning of the term by the SI supervisor; activities by the course professor during the term; activities by the SI leader during the term; activities by the SI supervisor during the term; and activities by the SI supervisor after the academic term. It is critical that students see the relevance and connection between the activities that occur during SI sessions and what occurs during the professor's lectures.

Arendale, D. R. (1997). *Supplemental Instruction: Review of research concerning the effectiveness of SI from The University of Missouri-Kansas City and other institutions across the United States.* Conference Proceedings of the 18th Annual Institutes for Learning Assistance Professionals, Tucson, AZ. (ERIC Document Reproduction Service ED457797). Retrieved from http://www.lsche.net/?page_id=1044
This paper provides a narrative overview of the Supplemental Instruction (SI) model and a review of the major research studies concerning SI. The studies are based on data from the University of Missouri-Kansas City and a separate data base of nearly 5,000 research reports describing the use of SI at 270 institutions with a total student enrollment of more than 500,000 in the classes where SI was offered.

Arendale, D. R. (1998). Increasing the efficiency and effectiveness of learning for first year college students through Supplemental Instruction. In P. L. Dwinell & J. L. Higbee (Eds.), *The role of developmental education in preparing successful college students* (pp. 185-197). Monograph Series No. 19. Columbia, SC: The National Association for Developmental Education and the National Center for the Study of the Freshman Year Experience and Students in Transition.(ERIC Document Reproduction Service No.

ED423794). Retrieved from
https://netfiles.umn.edu/users/arend011/www/peer/DAincreaseefficiencySI97.pdf.
Supplemental Instruction (SI) can be a powerful force for increasing the efficiency and effectiveness of learning for students during the first year of college. With the paradigm shift from a focus on teaching to improvement of student learning, institutions are looking for a systematic approach to changing the campus learning culture. This chapter describes how SI addresses these needs and also provides a review of research in the U.S. and other countries regarding the impact of SI with improving student academic performance.

Arendale, D. R. (1999). *Introduction.* Conference Proceedings of the First National Conference on Supplemental Instruction/VSI, Kansas City, MO.
The author provides an introduction to the conference proceedings of the First National Conference on Supplemental Instruction/VSI held in Kansas City, MO during May 1999.

Arendale, D. R. (2001). *Effect of administrative placement and fidelity of implementation of the model of effectiveness of Supplemental Instruction programs.* (Ph.D. dissertation), University of Missouri-Kansas City, Kansas City, MO. (ERIC Document Reproduction Service No. ED480590)
This 456 page research study investigated variables that may influence effectiveness of the Supplemental Instruction learning assistance and enrichment program at the University of Missouri-Kansas City and other U.S. postsecondary institutions. Study number one analyzed variables related to academic performance of University of Missouri-Kansas City students (mean final course grades, rate of course withdrawal, and rate of persistence). Study number two investigated variables at 735 U.S. postsecondary institutions related to academic performance of students and satisfaction level with the campus Supplemental Instruction program. Independent variables included: administrative placement of the SI program unit (academic affairs, student affairs, or other), age of the SI program, fidelity of the program to SI program activity constructs (SI Supervisor involvement, SI Leader involvement, SI Leader training, institutional involvement), and four dependent variables (mean final course grades, mean percent of D and F final course grades and course withdrawals, mean percent of students who participate in the program, and satisfaction level with the program). Study number one found positive correlation between higher academic achievement and persistence rates with the independent variables of SI attendance and measures of precollegiate academic achievement. The entire known population of 735 SI programs within the United States was selected for study number two. There were statistically significant positive correlations with three of the four program activity constructs (SI Supervisor Involvement, SI Leader Involvement, and SI Leader training) and the effectiveness of the program regarding improved student outcomes and higher satisfaction ratings by the campus administrators who supervised the program. There were no statistically significant differences between the different program administrative placement locations and the dependent variables. Implications from this research include identification of key activities within the program that should be observed to maximize program effectiveness for the institution and participating students. Besides the two quantitative studies, an extensive review of the literature regarding the history of

developmental education and learning assistance programs in the United States produced six discernable historical phases. Supplemental Instruction was placed within this social context in American history. The appendix includes an extensive annotated bibliography of 450 publications and other media types published by authors worldwide related to Supplemental Instruction.

Arendale, D. R. (2002). History of Supplemental Instruction: Mainstreaming of developmental education. In D. B. Lundell & J. L. Higbee (Eds.), *Histories of developmental education* (pp. 15-27). Minneapolis, MN: Center for Research on Developmental Education and Urban Literacy, General College, University of Minnesota.Retrieved from http://www.education.umn.edu/CRDEUL/monographs.html.
Postsecondary institutions throughout the nation's history have provided developmental education and learning assistance programs to meet the academic standards expected of admitted college students. This history of developmental education provides a context for creation of the Supplemental Instruction (SI) program in 1973 at the University of Missouri-Kansas City to meet immediate needs at the institution due to a high attrition rate among students enrolled in professional schools. The national, and eventual international, dissemination of the SI model was due to it meeting similar needs at other institutions as well. SI has become a widely adopted method of mainstreaming the best practices of developmental education with college-level courses.

Arendale, D. R. (2003). *Supplemental Instruction study strategies: Using the Information Processing Model*. Unpublished manuscript. University of Minnesota. Minneapolis, MN. Retrieved from https://netfiles.umn.edu/users/arend011/www/peer/SIandIPM.pdf
This document describes how the Information Processing Model of learning can be applied to SI session strategies employed by the student SI leaders. Session activities are associated with each of the stages of IPM to encourage SI leaders to employ a wide variety of activities to meet the needs of students at each stage of the IPM learning model.

Arendale, D. R. (2004). Pathways of persistence: A review of postsecondary peer cooperative learning programs. In I. M. Duranczyk, J. L. Higbee & D. B. Lundell (Eds.), *Best practices for access and retention in higher education* (pp. 27-42). Minneapolis, MN: Center for Research on Developmental Education, General College, University of Minnesota.Retrieved from http://education.umn.edu/CRDEUL/monographs.html.
This chapter focused intentionally on a subset of the educational practice that share a common focus with increasing student persistence towards graduation. Rather than a meta-analysis of all published research studies, this chapter is a preliminary review and a description of six models. At the end of the chapter several suggestions are made for differentiating the models from each other and the level of institutional resources and resolve with implementing them. The six student peer learning programs included in this chapter meet the following characteristics: (a) the program must have been implemented at the postsecondary or tertiary level, (b) the program has a clear set of systematic procedures for its implementation at an institution, (c) program evaluation studies have been conducted and are available for review, (d) the program intentionally

embeds learning strategy practice along with review of the academic content material, (e) the program outcomes include both increased content knowledge with higher persistence rates, and (f) the program has been replicated at another institution with similar positive student outcomes. From a review of the professional literature six programs emerged: Accelerated Learning Groups (ALGs), Emerging Scholars Program (ESP), Peer-Led Team Learning (PLTL), Structured Learning Assistance (SLA), Supplemental Instruction (SI), and Video-based Supplemental Instruction (VSI). As will be described in the following narrative, some of the programs share common history and seek to improve upon previous practices. Other programs were developed independently.

Arendale, D. R. (2008). Selected annotated bibliography for Supplemental Instruction. In M. E. Stone & G. Jacobs (Eds.), *Supplemental Instruction: Improving first-year student success in high-risk courses* (Monograph No. 7, 3rd ed., pp. 97-105). Columbia, SC: University of South Carolina, National Resource Center for the First-Year Experience & Students in Transition
This appendix provides a short annotated bibliography of important publications related to Supplemental Instruction (SI) of the past two decades.

Arendale, D. R. (2009). Course-based Learning Assistance (CLA) program guide. In S. Clark-Thayer & L. P. Cole (Eds.), *NADE self-evaluation guides: Best practice in academic support programs* (2nd ed., pp. 105-138). Clearwater, FL: H&H Publishing.
These program standards provide guidance for management of postsecondary peer cooperative learning programs such as Supplemental Instruction (SI), Structured Learning Assistance (SLA), Emerging Scholars Program (ESP), Peer Assisted Learning Program (PAL), and Peer-led Team Learning (PLTL). These standards were developed through extensive field testing of professionals in the field operating these peer learning programs. There are six sections to the chapter: mission and goals; assessment and evaluation; program design and activities; human resources; and value system. The items within each section are divided between essential (important for any peer learning program) and recommended (useful for some peer learning programs due to their design). A more detailed examination of assessment and evaluation of peer learning programs is provided elsewhere in the larger publication.

Arendale, D. R. (2009). Specific assessment and evaluation protocols for Course-based Learning Assistance (CLA) programs. In S. Clark-Thayer & L. P. Cole (Eds.), *NADE self-evaluation guides: Best practice in academic support programs* (2nd ed., pp. 183-193). Clearwater, FL: H&H Publishing.
These program standards provide guidance for assessment and evaluation of postsecondary peer cooperative learning programs such as Supplemental Instruction (SI), Structured Learning Assistance (SLA), Emerging Scholars Program (ESP), Accelerated Learning Groups (ALGs), Video-based Supplemental Instruction (VSI), and Peer-led Team Learning (PLTL). These standards were developed through extensive field testing of professionals in the field operating these peer learning programs. There are four progressive levels of assessment and evaluation: program activity reports, immediate outcomes, short-term outcomes, and longer-term outcomes. The levels

within each section are divided among questions to investigate, data needed for collection for analysis, and finally, analysis procedures. Depending on the particular peer learning program, some of these protocols would be more appropriate than others. A more detailed examination of mission, program design, administration, and other issues related to implementation of peer learning programs is provided elsewhere in the larger publication.

Arendale, D. R. (n.a.). *Supplemental Instruction: Structured learning communities*. Unpublished manuscript. University of Minnesota. Minneapolis, MN. Retrieved from https://netfiles.umn.edu/users/arend011/www/peer/SIstructuredcommunities.pdf
This PowerPoint presentation illustrates the connection between Supplemental Instruction (SI) and learning communities.

Arendale, D. R., & Martin, D. C. (1997). *Review of research concerning the effectiveness of Supplemental Instruction from the University of Missouri-Kansas City and other institutions*. Unpublished manuscript. The University of Missouri-Kansas City. Kansas City, MO. Retrieved from ERIC database. (ED370502).
This report provides both a narrative overview of the Supplemental Instruction (SI) model and a review of the major research studies concerning SI. A major portion of the research concerns a meta-analysis of SI research from 270 institutions from across the U.S. The analysis reviewed 4,945 research studies of 505,738 college students between 1982-83 and 1995-96. Regardless of institutional type or academic discipline, SI participants in comparison with non-participants receive mean final course grades that are higher (2.42 vs. 2.09), higher rates of A or B final course grades (46.8% vs. 35.9%) and mean percentages of D, F and withdrawal rates that are lower (23.1% vs. 37.1%). Even when the data is separated by broad academic disciplines or individual departments or classes, the positive differences for SI participants remain. In a national study of 13 institutions and 2,410 students, the question of helpfulness of SI for students of color was examined. The study found that students of color participated in SI at rates equal or exceeding those of White students (White, 33.8%; African American, 42.0%; Latino, 50.9%; Asian/Pacific, 33.3%; and Native American, 42.9%). Students of color received higher grades than similar students (2.02 final course grade vs. 1.55, rate of 36% for D, F, or W vs. 43% for non-SI participants). Studies from the University of Missouri-Kansas City mirror those from the national studies. A study of UMKC that examines 375 courses with an enrollment of 14,667 students year by year from 1980-81 to 1995-96 found that SI participants earned high mean final course grades, higher rates of A and B final course grades and lower rates of D, F and course withdrawals. In a Winter 1996 study concerning the potential bias of student motivation the results favored the SI participants. SI participants received: final course grade of 2.78, rate of 58.9% for final grades of A or B, rate of 17.2% for D, F or W. The non-SI motivational control group received lower levels of academic achievement: final grade of 2.16, 33.9% A or B, and 26.8% for D, F or W. All other non-SI participants received grades similar to the motivated non-SI group: final grade of 2.38, A or B rate of 42.7%, and 38.6% D, F or W. In a study of UMKC students separated into quartile groups on the basis of standardized entrance test scores, the SI participants outperformed their non-SI counterpart quartile group in nearly all comparisons. Top quartile: SI group 3.29 final

course grade vs. 2.83 for non-SI, 92.9% reenrollment vs. 93.1% for non-SI; Middle two quartile groups: SI group 2.67 vs. 2.28, 90.5% reenrollment vs. 77.9% for non-SI; Bottom quartile: SI group 2.10 final course grade vs. 1.77 for non-SI, 85.6% reenrollment vs. 77.9% for non-SI. A study of SI attendance during Winter 1996 suggested a positive correlation between higher academic achievement and higher levels of SI attendance: no SI attendance: 2.37 final course grade, 42.2% A or B, 39.3% D, F or W; attended one to three times: 2.77, 56.3% A or B, 21.4% D, F or W; attended four to seven times: 2.82 final course grade, 63.0% A or B, 17.4% D, F or W. In a study of UMKC students who were first-time freshmen students in 1989, SI participants had graduated at a rate of 46.0% by Fall 1996 as compared with 30.3% of students who had never participated in SI. Other studies include research questions concerning demographic variables and rival hypotheses.

Arendale, D. R., & Martin, D. C. (2001). Introduction to special issue on Supplemental Instruction with underprepared students. *Journal of Developmental Education, 24*(3), 2, 40. Retrieved from https://netfiles.umn.edu/users/arend011/www/peer/Introduction00.pdf.
The guest editors provide an overview to the special theme issue of the journal that was devoted to Supplemental Instruction (SI). The introduction provides context for the collection of articles by describing the origins of the SI program.

Arendale, D. R., & McLaren, A. (1999). *Supplemental Instruction: Variations on the basic theme.* Conference Proceedings of the Annual Conferences of the Pennsylvania Association of Developmental Educators, Hershey, PA. (ERIC Document Reproduction Service No. ED 428632). Retrieved from http://www.eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/17/77/3c.pdf and https://netfiles.umn.edu/users/arend011/www/peer/SIvariations98.pdf
This paper describes some of the successful variations of Supplemental Instruction (SI). After an initial overview of SI, descriptions about innovations of the model. The first concerns Video-based Supplemental Instruction (VSI). VSI is described as an information delivery system. College students enroll in telecourses that are identical to credit courses delivered live on campus by the same professor. Students enrolled in these VSI course sections attend class eight hours a week rather than three hours since the videotape lectures are frequently stopped to engage in SI session activities. Developmental level students enrolled in VSI course sections earn higher final course grades than the traditional students enrolled in the live course sections. The second variation of the SI model is to use it for faculty development and renewal. Successful models include Salem State College and Anne Arundel Community College. Common activities include: SI leader providing anonymous feedback to the course lecturer; lecturer incorporating SI session activities inside of class sessions; lecturers serving as assistant SI supervisors and expanding their instructional/learning skills by observing other professors; and other associated activities.

Ashwin, P. W. H. (1993). *Supplemental Instruction: Does it enhance the student experience of higher education?* (Ph.D. dissertation), Kingston University, London, England.

This doctoral dissertation is concerned with the student experience of Higher Education in Britain that is influenced by Supplemental Instruction (SI). The qualitative research study of SI's impact in two classes (Applied Social Science and Computer Science) at Kingston University (UK) included interviews with SI leaders and questionnaires of first year students who were enrolled in the two classes. The purpose of this case study was to examine to what extent the educational theory of SI was matched by the student experience of it. Qualitative research suggests that SI was beneficial to students who took advantage of the service. SI leaders listed the following benefits of the program for themselves: increased confidence, greater sense of community between different years of the course, greater understanding of the material they were facilitating, and increased interest by potential employers because of the cocurricular nature of the SI leader experience.

Ashwin, P. W. H. (1994). The Supplemental Instruction leader experience: Why SI is not teaching, a student's perspective. In C. Rust & J. Wallace (Eds.), *Helping students to learn from each other: Supplemental Instruction, SEDA Paper 86* (pp. 87-90). Birmingham, England: Staff and Educational Development Association
This chapter provides both a perspective as both a leader and supervisor in the Supplemental Instruction program at Kingston University and Newham College of Further Education in the United Kingdom. SI sessions is not about teaching for a number of reasons: new information is not given in addition to that provided by the professor; SI participants create the agenda for the SI sessions; no formal assessment is taken; equal focus is placed on the process of learning of material as well as the material itself; and students do not perceive themselves in the same type of power relationship with the SI leader as they feel with the course professor. SI leaders focus on involving all students at the sessions and having them process the course material.

Ashwin, P. W. H. (2002). Implementing peer learning across organisations: The development of a model. *Mentoring & Tutoring, 10*(3), 221-231.
This article describes different ways to implement peer learning programs at institutions in the United Kingdom. A deeper understanding of organizational change can help guide administrators as they implement new programs. A version of Supplemental Instruction (SI) has been contextualized for the British postsecondary education system. An adaptation of Lewin's theory of change (1952) is applied with implementing the peer learning programs. This is an important area for further investigation since this is an important variable for the continued success of the SI program due to the need for strong support both from the administrators as well as a supportive culture that has embraced the program.

Ashwin, P. W. H. (2003). Peer Support: Relations between the context, process and outcomes for the students who are supported. *Instructional Science, 31*(3), 159-173. Contact the author at: Institute for the Advancement of University Learning, University of Oxford, Littlegate House, St Ebbe's Street, Oxford OX1 1PT, UK (E-mail: paul.ashwin@learning.ox.ac.uk).
This paper describes a research study with a version of Supplemental Instruction in the United Kingdom. An investigation of the outcomes of a Peer Support scheme for the

students who are supported is reported. It was found that attendance at Peer Support sessions was positively and significantly correlated to academic performance. This relationship was found even when prior levels of academic performance were controlled for. However, it was also found that students who attended Peer Support sessions adopted less meaning orientated approaches to studying over the course of the academic year. It is argued that this is an indication that the quality of the learning of these students fell. Qualitative evidence suggests that this change in approach was in response to an increased awareness of the assessment demands of the course and that these students had become more strategically orientated in their approach to studying as a result of their attendance at Peer Support sessions. It is argued that these results suggest that the outcomes and operation of this Peer Support scheme were influenced by the context in which it operated. Two implications of these findings are discussed.

Australasian Centre for PASS. (2011). *Peer Assisted Study Sessions (PASS): Guideslines for best practice*. Unpublished manuscript. University of Wollongong. Wollongong, Australia, NSW. Retrieved from http://www.uow.edu.au/content/groups/public/@web/@stsv/@pass/documents/doc/uow099559.pdf
This document outlines the guidelines for best practice for PASS (Peer Assisted Study Sessions) in the Australasian region and serves to distinguish PASS from other Peer Learning initiatives. These guidelines have been collaboratively developed by a working party representing the Australasian PASS community.

Avdiu, A. (2006). *An evaluation of Access to Learning Fee program: Supplemental Instruction.* (Master of Science thesis), University of Wisconsin-Stout, Stout, Wisconsin. Retrieved from http://minds.wisconsin.edu/bitstream/handle/1793/41889/2006avdiua.pdf?sequence=1
In 1999, the students of University of Wisconsin - Stout voted for the Access to Learning Fee, which is a budget funded by student fees to improve the learning environment. Through increasing the operating hours of laboratories, providing tutoring, Supplemental Instruction (SI), childcare, and graduate assistantships, the concerned collective of the UW-Stout administration believe that attrition of undergraduates will be reduced and students overall learning experience will be improved. The SI program was implemented to target Math-120, Computer Science-142, and Computer Science-144 courses that are considered to be very difficult for and contribute to attrition of students. It is a peer-lead tutoring program that offers students assistance outside of class lectures. This program was evaluated by assessing archival data such as students' grades, frequency of sessions attended, and program satisfaction survey data. The author hypothesized that students who attend at least one SI session receive higher final grades in the course that those who do not attend any SI sessions. The findings reveal to us that students who attend SI sessions have higher grades compared to those who did not attend any SI sessions. Qualitative findings also suggest that students are highly satisfied with the program and its leaders.

Bailey, A., & Cooper, W. . (2009). *Supplemental Instruction versus traditional remedial classes: Which methods should be used by community colleges in the classroom?* Unpublished manuscript. University of Central Florida. Orlando FL. Retrieved from http://wmacooper.pbworks.com/f/research%20proposal%20combined-final%20TO%20SUBMIT.pdf
In this proposed study, we wish to investigate which method would benefit community college students enrolled in developmental math classes, Supplemental Instruction versus Traditional Remedial classes. The research involves an experimental design, where we will compare two major groups-one attending developmental math classes with supplemental instruction (math lab, and assigned mandatory tutors), and the other attending traditional developmental math classes. The methodology section will include the following: research design, participants, instrumentation, procedures, data analysis, threats to internal and external validity, and possible limitations of the study.

Barham, W. A. (2001). A supplemental learning assistance model for developmental learners. In V. L. Farmer & W. A. Barham (Eds.), *Selected models of developmental education programs in higher education* (pp. 167-183). Lanham, NY: University Press of America
This chapter provides a comprehensive overview of the Supplemental Instruction (SI) program. After providing a short history of developmental education in American higher education, the book chapter reviews the theoretical framework for SI, program organization, procedures for SI sessions, and a selected review of research concerning outcomes of the SI program for SI participants and the institution.

Barlow, J., & Gardiner, P. (1994). Introducing Supplemental Instruction in engineering courses. In C. Rust & J. Wallace (Eds.), *Helping students to learn from each other: Supplemental Instruction, SEDA Paper 86* (pp. 17-24). Birmingham, England: Staff and Educational Development Association
The authors describe the implementation of Supplemental Instruction in civil, mechanical, and electrical engineering courses at Brighton University in the United Kingdom. SI was introduced in response to increasing pressures in higher education with reduced resources, much wider access, and changes in academic organizations. Evaluation reports suggest improvement by both the SI participants as well as the SI leaders.

Barrett, M., Sutcliffe, P., & Smith, B. (1994, 1994). *Students as mentors: The case of management education.* Conference Proceedings of the Proceedings of the Conference of the Australian and New Zealand Academy of Management, Wellington, Australia.
This paper describes the use of Supplemental Instruction (SI) to have advanced-level students (peer mentors) help commencing students (mentees) overcome the teaching and learning problems often associated with large lecture-based introductory courses in management in several courses at Queensland University of Technology (Australia). "Management and Organization" has the primary focus for this study. Students who attended six or more sessions had significantly higher final course grades than those who attended less than six times. It appears that motivation or self-selection was not a major variable since the students who attended six or more times had a similar

academic profile to students who did not attend at the same frequency. Surveys of students suggested that the mentoring program helped them to develop new study strategies and approach the material in a more effective manor. Mentors reported that they improved their interpersonal communication skills, ability to mange group dynamics, and enhanced their personal study skills.

Bartlett, G., Terblanche, N., & Eastmond, J. N. (1996). *The politics and process of student involvement in a programme of Supplemental Instruction*. Paper presented at the South African Association for Academic Development Conference, University of Fort Hare, Republic of South Africa.
This paper recounts the steps (and missteps) taken in beginning an Supplemental Instruction (SI) program in two academic departments at Border Technikon (South Africa): Accounting and Management. It documents the steps taken to draw upon the resources of the Student Representative Council (SRC) in setting policy, selecting tutors, and maintaining the program's funding base. The authors advocate that SI program success is dependent upon a partnership with faculty and students sharing a stake in the outcomes. The SRC representatives advocated that all students should be eligible for consideration as SI leaders. Their view was that even academically weaker students could be helpful since they understood the challenges in the course and could help others. Also, the SRC viewed SI as a service for students and that volunteers should be solicited. In both cases, the compromise was that all students were eligible for the SI leader position however it was felt that the SI leader should be compensated for the large time commitment required. Interviews with SI leaders suggested the following benefits: increased confidence with public speaking; more interaction with course faculty; development of teaching skills; and improved personal study strategies. Interviews with SI participants suggested improved: better understanding of course material; opportunity to practice academic skills; freedom to discuss material in the smaller, relaxed SI session environment; and higher test scores.

Battistelli, L. (2004, 2004, August 30). Cal State-Long Beach center assists students in learning, *Forty-Niner CSU-Long Beach Newspaper*.
This school newspaper article describes how the Supplemental Instruction (SI) program is part of the services provided by the California State University-Long Beach learning center.

Beasley, C. J. (1997). *Students as teachers: The benefits of peer tutoring.* Conference Proceedings of the 6th Annual Teaching Learning Forum, Murdoch University. Retrieved from http://lsn.curtin.edu.au/tlf/tlf1997/beasley.html
Supplemental Instruction (SI) has been customized for use at several institutions in Australia. Program results for SI participants include: improved understanding and performance in the subject area involved, improved confidence and study skills, as well as on-going friendships. SI leaders also report improvement in content knowledge and personal skills. This paper focuses quantitative and qualitative analysis concerning the use of SI at Murdoch University with business students in 1995. The two courses studied were Principles of Commercial Law and Introduction to Accounting. Many of the participants were international students.

Beaumont, T. J., Mannion, A., P, & Shen, B. O. (2012). From the campus to the cloud: The online Peer Assisted Learning Scheme. *Journal of Peer Learning, 5*(1), 1-15. Available: http://ro.uow.edu.au/aipl/vol15/iss1/6.
This paper reports on an online version of Peer Assisted Study Sessions (PASS), also known as Supplemental Instruction (SI), which was trialled in two subjects in the University of Melbourne in 2011. The program, named the Online Peer Assisted Learning (OPAL) scheme, was implemented with the ai ms of extending the benefits of a successful peer learning program to students other than those who attend face-to-face sessions and contributing to scholarship on the viability of online peer learning with reference to student interest, leader and participant perspectives, and the suitability of synchronous communication platforms. Qualitative re search led to mixed findings.Although OPAL was considered to be a viable online peer learning program by leaders and participants, multiple challenges were encountered. With reference to literature onrelated initiatives and the use of synchronous online learning platforms in higher education, this paper provides an account of the establishment and progress of the initiative, before presenting an analysis of its st
rengths and weaknesses and a series of recommendations for researchers and practitioners w ho are interested in online adaptations of face-to-face peer learning programs.

Bech, T., & Donelan, M. (2000). *Supplemental Instruction Leaders' Conference Report*. London, UK: University College London.
This report describes events at the 7th annual Supplemental Instruction (SI) Leaders' Conference. The annual conference draws together SI leaders from across the U.K. This conference was held at St. Martin's College in Ambleside in the Lake District of England from April 17 to 19, 2000.

Beckman, K., & Powell, D. A. (2004). *NDSU Supplemental Instruction*. Paper presented at the 227th American Chemical Society National Meeting, Anaheim, CA.
Supplemental Instruction (SI) was implemented at North Dakota State University to serve students in science courses such as general chemistry and organic chemistry. Studies suggest that regular attendees of the voluntary SI sessions attain higher final course grades.

Beckmann, E. A., & Kilby, P. (2008). On-line, off-campus but in the flow: Learning from peers in developmental studies. *Australasian Journal of Peer Learning, 1*, 61-69. Retrieved from http://ro.uow.edu.au/ajpl/vol1/iss1/8.
At the Australian National University, peer learning is a key for improved student learning outcomes for those enrolled in the Master of Applied Anthropology and Participatory Development (MAAPD) program .Online discussions support peer learning and provided opportunities for more shared engagement in critical thinking about issues of concern raised through the courses. An online collaboration learning environment called Alliance was employed to provide a more full collaborative learning environment. Using best principles from the Peer Assisted Learning Strategies (PALS) program that used traditional face-to-face student discussions, Alliance employed a variety of

learning tools for online collaboration. Threaded discussions were a key element for developing meaningful online learning. It was critical to form students into smaller work teams that had more accountability regarding their continuous participation. These discussions needed structure and also an assigned facilitator to help guide the discussion and prompt participation, much in the same way as the student facilitator was key for the face-to-face PALS sessions.

Bengesai, A. (2011). Engineering students' experiences of Supplemental Instruction: A case study. *Alternation, 18*(2), 59-77. Retrieved from http://food.ukzn.ac.za/docs/Alternation%2018.2%20%282011%29.pdf#page=63.
This article explores Engineering students’ experiences of Supplemental Instruction (SI). SI is a student engagement approach that is meant to provide ‘support’ to students with the aim of improving pass rates. The sample population used in the study was constituted from the 2009 Chemical Engineering cohort. From this broad sample, the performance scores of 15 regular SI attendees were tracked over a period of three semesters. Qualitative data was also collected through focus-group discussions with six of the regular attendees. The data was analysed using an interpretive methodology. The findings from the study suggest that SI has the potential to provide positive learning spaces for students, enabling them to effectively engage with learning materials. However, the results also underscore the need to modify the programme to ensure that students do not become overly reliant on it.SI was introduced at the Faculty of Engineering in the University of KwaZulu-Natal (UKZN), South Africa, in 2008. This project was conceived and enabled through a Faculty grant from the Department of Higher Education and Training to improve throughput and curb attrition rates.

Best, G., Hajzler, D., Ivanov, T., & Limon, J. (2008). Peer mentoring as a strategy to improve paramedic students' clinical skills. *Australasian Journal of Peer Learning, 1*, 13-25. Retrieved from http://ro.uow.edu.au/ajpl/vol1/iss1/4
This paper documents the rationale and outcomes of a peer mentoring program based on Supplemental Instruction (SI) in which selected third year paramedic students took on the role of mentors within a second year clinical practice subject. Participating students reported an improvement with their clinical skills. At VIctoria University in Australia the SI program has been customized and renamed Peer Assisted Study Sessions (PASS). This approach was designed to improve students' clinical skills and judgment and to improve their confidence and use of clinical equipment. The PASS mentors reported gains in assistance with projects, revitalized interest in work, and increased self-confidence. Mentees reported increases in their learning and development, increased personal support, and an increase in confidence. The program also provided students with a leadership role to extend their own competency with the content material. The authors suggested that the PASS program could be enhanced in the future to further improve its impact on leadership development of the mentors.

Best, G., Hajzler, D., Pancini, G., & Tout, D. (2011). Being 'dumped' from Facebook: Negotiating issues of boundaries and identity in an online social networking space. *Journal of Peer Learning, 4*(1), 24-36. Retrieved from http://ro.uow.edu.au/ajpl/vol4/iss1/5.

Social networking spaces such as Facebook were investigated as an enhancement to a Peer Assisted Study Sessions (PASS) at Victoria University in Melbourne, Australia. PASS is based on the Supplemental Instruction (SI) model.The authors suggest careful consideration as well as explicit negotiation among PASS staff and student participants to set appropriate boundaries for the use of Facebook within PASS. The PASS program created a Facebook account to facilitate communication among the PASS participants. The PASS administrative staff members were 'dumped' from the Facebook account because the students' perspective due to staff breaking boundaries due to their interactions. This paper provides a case study approach to understanding the complex relationships and expectations among students and staff members in a shared social space. Student PASS participants found the Facebook social space very helpful, even more so without non students.

Bidgood, P. (1994). *The success of Supplemental Instruction: Statistical evidence*. Birmingham, England: Staff and Educational Development Association.
Research studies from Kingston University (United Kingdom) suggest that Supplemental Instruction has been helpful in a wide range of courses. Several studies suggested that higher levels of SI attendance are correlated with higher final course grades: Computer Systems, 1990-91: 68.2 percentile vs. 61.3 percentile for non-SI and 1991-92: 61.9 vs. 61.0; Information Systems, 1990-91: 67.5 vs. 59.2 and 1991-92: 59.4 vs. 54.1; Software Engineering, 1990-91 52.9 vs. 50.4 and 1991-92: 48.6 vs. 42.9; Mathematics, 1990-91: 61.6 vs. 56.7 and 1991-92: 58.5 vs. 53.5; and Average Mark for All Courses, 1990-91: 62.7 vs. 56.9 and 1991-92: 57.0 vs. 52.8. Additional studies examined final course grades for comparable entry qualifications.

Bin Ibrahim, M. D., & Aaijaz, N. . (2011). Dynamics of peer assisted learning and teaching at an entrepreneurial university: An experience to share. . *International Journal of Humanities and Social Science, 1*(12), 93-99.
The process of Peer Assisted Learning (PAL) is a situation in which "people from similar social groupings who are not professional teachers help each other to learn and learn themselves by teaching. It is this reciprocity of learning among other things that makes PAL such an attractive idea to educationists. One mission of the FKP (in Malay language - Fakulti Keusahawanan dan Perniagaan) i.e. Faculty of Entrepreneurship and Business at University Malaysia Kelantan is to teach a curriculum developed on the model of “Continuous or Lifelong Learning Process” and “Learning Outcomes” (LO) for students with the help of novel processes like PAL, Collaborative Learning, PBL (Problem Based Learning) etc. We prepare our undergraduate students for successful transition into the entrepreneurial world. For this reason, most of our teaching experience at the University has been focused in this area. Noteworthy researches done in this area are - Jean Piaget (1896-1980), a Swiss psychologist, whose cognitive development theories have been widely discussed in both psychology and educational fields, identified that students must be active agents in creation of their own knowledge. Lev Vygotsky, a Russian psychologist, was interested in applying Marxist social theory to individual psychology (1978). Vygotsky’s research also differentiated between our higher and lower mental functions conceiving our lower or elementary mental functions to be those functions that are genetically inherited, our natural mental abilities. In

contrast, he saw our higher mental functions as developing through social interaction, being socially or culturally mediated (Wertsch, 1991:18)

Bjorsten, K., & Soderlund, S. (2004). *Variation of the model: Using study mentors and SI leaders*. Unpublished manuscript. Linkoping Institute of Technology. Sweden.
A variation of the Supplemental Instruction (SI) model is being used at the Linkoping Institute of Technology in Sweden during 2003. SI was offered to student in rigorous Calculus and Chemistry courses. Students were asked to complete surveys regarding their satisfaction with the SI program. While the students found the SI program useful, the grade improvement for them was not satisfactory according to the SI program directors. Results of this evaluation was to more carefully select the future SI leaders and provide more training for them.

Black-Heiman, D. K. (1999). *Effect of a relational type intervention on college students' self regulated learning.* (Ph.D. dissertation), The Ohio State University, Columbus, OH. Dissertation Abstracts International database. (2811A).
The topics of learning and achievement have been of interest since the early 1900's. In the 20th century, the work of many prominent researchers has led to a better understanding of how factors such as human behavior, personality, cognition, learning styles, and motivation influence individual learning. Current research on academic achievement includes two areas: a relational type study skills intervention, Supplemental Instruction, and self regulated learning. Supplemental Instruction (SI) was an intervention designed by Deanna Martin in the early 1970s. Many studies have shown that students who receive SI for a specific course get better grades than students who do not participate in supplemental instruction for that course. The success of the intervention is due to the fact that difficult courses are targeted rather than at-risk students, study skills are taught within the context of one course, and that the group of students are led by a peer who has recently taken the course and done well. Research on self regulated learning has shown that individuals who achieve academic success share similar characteristics. Self regulated learners are motivated to learn, use cognitive strategies such as rehearsal, elaboration, and organization when they study, and they do particularly well in metacognitively knowing when and how to apply those cognitive strategies when they study. The current study attempted to implement the concepts of self regulated learning into a modified version of SI for a college level history course. The treatment was referred to as a relational type intervention (RTI). Students in the treatment group at Ohio State University discussed their motivation for the course, were taught study skills specific to history, and were taught when and how to implement such strategies. The current treatment differed from original SI in that RTI occurred within a regularly scheduled recitation time rather than outside of class time, students consented to treatment but did not volunteer to participate, a student with a master's degree implemented the treatment rather than a peer who recently did well in the course, and new material was sometimes introduced during recitation so time was not only devoted to study skill implementation. Due to these differences, careful consideration was taken not to compare the current study with SI. Multivariate analysis of variance was used to determine what effect SI had on students' self regulated learning. The results indicated that there were no statistically significant differences

between the treatment and control groups on posttest dependent measures: motivation, cognitive strategy use, and metacognitive strategy use. The instrument used to measure self regulated learning components was the Motivated Strategies for Learning Questionnaire.

Blanc, R. A., DeBuhr, L., & Martin, D. C. (1983). Breaking the attrition cycle: The effects of Supplemental Instruction on undergraduate performance and attrition. *Journal of Higher Education, 54*(1), 80-89.
This article concerns an evaluation of the Supplemental Instruction (SI) program at the University of Missouri-Kansas City. The research study looked at the academic performance of 746 students enrolled in seven Arts and Sciences courses during Spring 1980. A variety of research studies were completed using data gathered from this and subsequent academic terms. SI participants in comparison with non-SI participants of similar demographic background earned higher levels of academic achievement. The first study looked at mean final course grades and the rate of D, F and course withdrawals for three groups: SI participants, non-SI participants, and motivational control non-SI participants. Students assigned to the motivational control group were those who, on a Likert scale, indicated higher interest in attending SI sessions, but who were prevented from attending because of scheduling conflicts (e.g., work, class). The final course grades favored the SI participants (2.50, DFW rate of 18.4%, $p < .01$) over the motivational control non-SI group (2.36, DFW rate of 26.5%) and other non-SI group (1.57, DFW rate of 44.0%). SI and non-SI participants were tracked regarding reenrollment rates for two succeeding academic terms. In both cases the results favored the former SI participants (Fall 1980: SI 77.4% vs. non-SI 67.3%; Spring 1981: SI 73.2% vs. non-SI 60.0%). When the students were separated by quartile groups on the basis of standardized entrance exams, SI participants outperformed their counterparts (Top quartile: final grade SI 3.10 vs. non-SI 2.30, reenrollment following term SI 86% vs. non-SI 78%; Bottom quartile: final grade SI 1.72 vs. non-SI 0.88, reenrollment following term SI 74% vs. non-SI 62%). There were long-term reductions in the percentage of D, F and withdrawals in the courses where SI was offered to students (from 34% before introduction of the SI program down to 18% during the SI program's second year). This article was the first one published outside of developmental education publications to gain national attention concerning the SI model.

Blanc, R. A., & Martin, D. C. (1994). Supplemental Instruction: Increasing student performance and persistence in difficult academic courses. *Academic Medicine: Journal of the Association of American Medical Colleges, 69*(6), 452-454.
The authors describe the use of Supplemental Instruction (SI) with medical students to earn higher final course grades in historically difficult courses. The SI process has been used successfully with students who are preparing for the USMLE Step I examination. The authors state that SI can strengthen a prematriculation program for students whose MCAT scores place them in the high-risk category for completing the medical school curriculum. To maximize learning efficiency for students in the prematriculation program, the authors suggest that a small-group preview session precedes each lecture

and a small-group review follows. The article concludes with a short overview of Video-based Supplemental Instruction (VSI).

Blat, C., Myers, S., Nunnally, K., & Tolley, P. (2001, 2001). *Successfully applying the Supplemental Instruction model to sophomore-level engineering courses.* Conference Proceedings of the Proceedings of the 2001 American Society for Engineering Education Annual Conference & Exposition.
Supplemental Instruction (SI) has been used at the University of North Carolina at Charlotte for 15 years with mixed success in various academic content areas. In the past four years SI has been used in the College of Engineering in Statics (MEGR 2141), Mechanic of Solids (MEGR 2144), Network Theory II (ECGR 2112), and Applied Calculus for Engineering Technology students (EGET 3171). Research suggests that SI contributes to higher final course grades and lower rates of D, F, or course withdrawals. SI participants who attend five or more sessions during the academic term are more likely to persist for an additional academic term than students who do not. There were no significant differences regarding SI participation by gender, ethnicity, average Math SAT, average Verbal SAT, or average predicted GPA. The chapter concludes with recommendations for implementation of SI at a campus.

Blat, C., & Tolley, P. (2009). *Improving retention through peer mentoring, Supplemental Instruction, and tutoring*. Unpublished manuscript. William States Lee College of Engineering at the University of North Carolina at Charlotte. Charlotte, NC.
This PowerPoint presentation provides an overview of how Supplemental Instruction (SI) and other forms of academic assistance are used at the William States Lee College of Engineering at the University of North Carolina at Charlotte. Some data studies are shared as well to validate their effectiveness.

Blat, C. M., & Nunnally, K. (2004). *Successfully applying the Supplemental Instruction model to engineering and pre-engineering.* Conference Proceedings of the Proceedings of the 2004 American Society for Engineering Education Annual Conference & Exposition.
Supplemental Instruction (SI) was used at the University of North Carolina-Charlottein engineering and pre-engineering classes to increase student grades in the courses. Final course grades are higher and the rates of D, F, and course withdrawals are lower.

Blunt, R. (2008). A comparison of medical students' preferences for structured and unstructured peer-learning. *Australasian Journal of Peer Learning, 1*, 40-50. Retrieved from http://ro.uow.edu.au/ajpl/vol1/iss1/6
At St. George's University in Grenada Supplemental Instruction (SI) is used to enhance both student learning outcomes as well as provide the academic support needed to earn high grades in rigorous courses in the medical school. This article discusses a survey that students were invited to complete concerning the SI program. About 20 percent of the students participate in the voluntary SI program. The most common reasons for participating in SI were: developing understanding, finding help when they could not understand something, preparing for exams, and keeping themselves

motivated, focused and working hard. Students were twice as likely to ask for academic help from a fellow student than the faculty member for the course.

Bocock, J. (1993). Supplemental Instruction: Striking a balance in the curriculum. *The Lecturer (The University & College Lecturers' Union)*, 7.
The Supplemental Instruction (SI) program is cited by Jean Bocock, Assistant Secretary for Higher Education in the United Kingdom, as one way to deal with a number of pressing educational needs: dealing with rising student to teacher ratios [8.5:1 in 1980 to almost 20:1 today]; shifting towards student-centered learning; and capitalizing upon the resources of students to teach other students. One concern expressed by NATFHE, the University & College Lecturers' Union, is that SI not be used as a cheap alternative to hiring trained staff and paying them a proper salary.

Bonsangue, M. V., Cadwalladerolsker, T., Fernandez-Weston, C., Filowitz, M., Hershey, J., Moon, H. S., . . . Engelke, N. (2013). The effect of Supplemental Instruction on transfer student success in first semester calculus. *The Learning Assistance Review, 18*(1), 61-75. Retrieved from http://www.calstate.edu/engage/documents/SIarticle-Spr2013.pdf.
This study focused on the impact of Supplemental Instruction (SI) on student achievement in first semester Calculus for transfer students over a three-year period. Transfer students participating in SI achieved dramatically higher passing rates and course grades than did non-transfer students, despite no significant differences in academic predictors between the two groups. The results here indicate that while SI has been shown to be an effective tool for many students, the academic and social elements of SI may be especially significant for STEM transfer students enrolled in gateway courses such as first semester Calculus.

Botha, L., Van der Merwe, A., & De Klerk, E. (1996, 1996, November). *Tutor programme vs. Supplemental Instruction at the University of Stellenbosch.* Conference Proceedings of the South African Association for Academic Development Conference, University of Fort Hare, Republic of South Africa.
The Division of Academic Programmes (DADP) at the University of Stellenbosch (South Africa) runs academic development programs serving the twelve faculties of the University. Both a traditional tutor program and Supplemental Instruction (SI) was provided as support and enrichment for the students. At the time of this paper's publication, quantitative data was not available for summative evaluation and comparison of the two approaches to academic assistance. Interviews with students suggested high satisfaction with the SI program for several reasons: high motivation level of SI leaders; opportunity to work on writing effective summaries during SI sessions; developing understanding of basic concepts and subject specific terminology; development of study strategies; and improved skills for completing essay examination questions.

Bowles, T. J., & Jones, J. (2003). An analysis of the effectiveness of Supplemental Instruction: The problem of selection bias and limited dependent variables. *Journal of College Student Retention, 5*(2), 235-243.

This article extends beyond the usual reliance upon single equation regression models to evaluate Supplemental Instruction (SI) and employs a simultaneous equation, limited dependent variable evaluation model. Results of the research study at Utah State University at Logan suggest that students with below average academic ability are more likely to attend SI and that common measures of student ability included in single equation models fail to adequately control for this characteristic. The authors suggests that the older evaluation models have underestimated the effectiveness of SI.

Bowles, T. J., & Jones, J. (2003). The effect of Supplemental Instruction on retention: A bivariate probit model. *Journal of College Student Retention, 5*(4), 431-437.
This study investigated the effectiveness of Supplemental Instruction (SI) with increasing student academic outcomes. While many previously published studies on SI have been single equation regression models, this study was a bivariate probit model. Two important issues investigated by these researchers included: both SI attendance and retention are categorical variables; both of these variables are jointly determined endogenous variables. This study suggests that single equation models are likely to overestimate the effect of SI participation.

Bowles, T. J., McCoy, A. C., & Bates, S. (2008). The effect of Supplemental Instruction on timely graduation. *College Student Journal, 42*(3), 853-859. Retrieved from http://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1103&context=psych_facpub.
This research study examines the use of Supplemental Instruction (SI) to increase the rate of timely graduation by participating students. Many state legislatures and education leaders demand for policy and financial reasons that students graduate with a bachelor's degree in four years rather than taking an extended time to complete their undergraduate degree, thereby requiring more institutional resources such as teaching faculty, housing, and other services. Self-selection bias is controlled in first-year level courses to investigate the potential impact of SI. During fall semester of 2001 and spring semester of 2002, 3,905 students at a large western land-grant institution, Utah State University, enrolled in first-year courses supported by SI. SI participant status was established as having attended SI sessions three or more times during their first-year course. Students were examined again in four years to determine their college graduation status. Holding all other variables constant, SI participation increases the probability of timely graduation by 11 percent.

Boylan, H. R. (1999). Exploring alternatives to remediation. *Journal of Developmental Education, 22*(3), 2-4, 6, 8, 10.
In this journal article Dr. Hunter Boylan, Director of the National Center for Developmental Education , the author explores five alternative ways to serve students who previously may have been served through traditional developmental education courses: (1) freshman year seminars; (2) Supplemental Instruction; (3) learning communities and collaborative learning; (4) paired courses; and (5) critical thinking instruction. For students that do not need the extensive time required by full academic-term length developmental courses, the five alternatives explored in the article might be as effective with the benefit of shorter investment of time, personnel, and money. The author cited three studies where SI has been especially effective with developmental

students: (1) Blanc, DeBuhr, & Martin, 1983; (2) Commander, Stratton, Callahan, & Smith, 1996; and (3) Ramirez, 1997.

Boylan, H. R., Bonham, B. S., & Bliss, L. B. (1992). *National study of developmental education: Students, programs and institutions of higher education*. Boone, NC: National Center for Developmental Education.
Through a grant from the EXXON Education Foundation, the National Center for Developmental Education conducted the most extensive study of developmental education. The 1989 to 1992 study included 116 institutions representing a wide diversity of types. More than 6,000 students were subjects of the longitudinal study. The purpose of the study was to determine what is actually done in developmental education, to explore whether or not developmental programs actually contribute to student success, and, if so, to identify what types of programs and services have the greatest impact upon student success. Among the list of instructional factors related to student success, Supplemental Instruction (SI) is one of the items. Other items listed were: mastery level performance, frequent testing, immediate feedback, required remediation, individualized instruction, lab activities, integrated teaching of critical thinking skills, and close proximity of classrooms and support services.

Bradley, P. (2007). Supplemental Instruction programs showing results. *Community College Week, 20*(1), 7.
This brief report indicates that Supplemental Instruction (SI) at Tidewater College in Norfolk, VA. Interviews with students share their positive comments about the usefulness of the SI program with supporting their academic success. The pass rate in an introductory English class increased from 60 to 70 percent after SI was attached to the course. The SI program is partially funded by a Lumina grant to support its Achieving the Dream initiative.

Brantley, F. (2009). *Supplemental Instruction: Working together to achieve success*. Unpublished manuscript. Kennesaw State University. Kennesaw, Georgia. Retrieved from
http://www.cfder.org/uploads/3/0/4/9/3049955/supplemental_instruction__working_together_to_achieve_success.pdf
This report has provided statistical evidence of the effectiveness of the SI program at Kennesaw State University. Specifically, SI participation was found to have a positive and beneficial effect on all student outcomes investigated. In all cases, however, the effect of SI participation on the student outcomes of interest was found to be mediated by some measure of previous academic achievement, either high school GPA, in the case of final grades, or standardized math test performance, in the case of DFW rates and current term GPA. The reason for an effect mediated by one over the other is not clear and will require further research. It is possible that these measures of academic achievement include other incidental or secondary characteristics of the students differentially. For example, it may be that high school GPA measures academic achievement as well as a substantial amount of student motivation, determination, and/or persistence while standardized math test performance may incidentally measure more aptitude and/or test-taking skills, etc. More research into these issues is needed.

SI participation was not found to be significantly mediated by verbal test performance. This may be attributable to the fact that the majority of historically difficult classes at Kennesaw State University are either science or math classes. As a result, math test performance is most likely more telling of a student's performance in these classes. In all cases, the variation between SI leaders was found to be negligible. This result provides evidence that SI participation is equally beneficial for students regardless of which SI leader is providing service. This may be interpreted as evidence validating the training of these leaders and the SI program at Kennesaw State University. These findings suggest that the recruitment and training of these individuals is producing a relatively homogeneous population of leaders who are equally effective at delivering SI services. As further research is done, we will examine this further. In contrast, all of the analyses found that the variation among instructors was statistically significant. This provides some evidence for the conventional wisdom that some instructors are more effective than others. The estimated variation between instructors was not substantial and may not be of practical importance. Further investigation into this issue is needed. Finally, the present analysis does not provide evidence of a causal relationship between SI participation and any of the student outcomes investigated. In other words, it is not possible to claim that SI participation causes positive changes in these outcomes. Simply, the reported effect of SI participation may be the result of other variables not represented in the data. One of the most likely candidates being student motivation. For example, with regard to the investigation of transferable skills measured by current term GPA: are students generalizing SI skills to their other classes or are more serious, motivated students simply choosing to go to SI more and also obtaining higher levels of achievement in their other classes which they would have obtained anyway? The current study was not designed to address these issues. In order to prove a causal relationship, a designed experiment would have to be performed where students are randomly assigned to different levels of SI participation during data collection. Congos and Schoeps (1993) noted, however, that the self-selection bias remains an inherent problem in the evaluation
of the program. While remaining mindful of this fact, the present analysis did include variables such as high school GPA and standardized test performance that surely serve as proxies for student motivation to some extent. In other words, a student's motivation certainly impacts their high school GPA as well as their academic performance in college. Because these proxy variables were included in the present analysis, student motivation has been accounted for to some un-known extent. Future investigation is needed to further delineate these relationships and their impact. This data is compelling; however, the voices of our students speak loudest when we begin to look at the success of our program:

Brazelton, W., Schmidtlein, P., & Baugher, M. (1981). *Reducing student attrition in the first-year economics course through skill-based Supplemental Instruction*. Paper presented at the University of Missouri Economics Conference, Columbia, MO. pages This paper discusses the use of Supplemental Instruction (SI) to improve student academic performance in introductory college-level economics courses at the University of Missouri-Kansas City. Data suggests that SI participants receive higher mean final course grades (66.6% A and B final course grades for SI participants vs. 45.6% for non-

SI participants) and a lower rate of D, F or course withdrawals (14.8% vs. 21.1%). The total percent of unsuccessful enrollments (D, F or course withdrawal) for the course was reduced from 34 percent before the introduction of SI to 19 percent during the second year that SI was offered to the students in the course.

Bridgham, R. G., & Scarborough, S. (1992). Effects of Supplemental Instruction in selected medical school courses. *Academic Medicine: Journal of the Association of American Medical Colleges, 67*(10), 569-571.
This article describes the use of Supplemental Instruction (SI) in the College of Human Medicine of Michigan State University with courses in biochemistry, physiology, pharmacology, genetics, gross anatomy, and histology. SI attendance was mandatory for all first- and second-year students who are on probation and optional for all others. A study of students enrolled in Biochemistry, Physiology, and Pharmacology courses between 1988 and 1990 suggests that SI attendance was correlated with higher mean final course grades. The authors suggest about twenty specific activities for SI sessions. In general, SI participants earned higher mean final course grades. The authors mentioned that the success of the SI program has encouraged the College to maintain an admissions policy that encourages a more diverse student population.

Briere, P., Congos, D. H., & Wallace, J. (Writers). (1995). Promoting the Supplemental Instruction program [Videotape]. In D. R. Arendale (Producer). Kansas City, MO: Center for Supplemental Instruction, The University of Missouri-Kansas City
This videotape discusses various aspects of promoting the Supplemental Instruction (SI) program. Discussion participants reviewed a variety of topics including recruiting SI leaders, promoting attendance among students, and gaining support from faculty and administrators. The panelists are campus SI supervisors as well as Certified Trainers with the SI program. Wallace is the Certified Trainer from the United Kingdom.

Briere, P., Garland, M., Visor, J. N., & Browning, S. (Writers). (1995). The use of Supplemental Instruction with target populations [Videotape]. In D. Arendale (Producer). Kansas City, MO: Center for Supplemental Instruction, The University of Missouri-Kansas City
This videotape records a panel discussion concerning the use of Supplemental Instruction (SI) with targeted subpopulations of students. Generally the SI program is provided for all students on campus. Due to specific needs and restricted funds, the SI program may be targeted with success for any of the following groups: students on academic probation; academically underprepared students; student-athletes; Upward Bound high school students; international students; and programs that limit grant funds to eligible populations (e.g., Carl Perkins Vocational, TRIO programs). The panelists discuss how to market to these student groups and conduct appropriate evaluation systems. The panelists are campus SI supervisors as well as Certified Trainers with the SI program.

Brock, L. (2003). *Effect of Supplemental Instruction on academic performance of community college students.* (Master of Arts thesis), California State University, Stanislaus, CA.

This study examined the potential impact of Supplemental Instruction (SI) with public community college students enrolled at Modesto Junior College (CA). The analysis included both the level of involvement in SI as measured through sessions attended as well as the preentry attributes of the students: prior academic achievement, prerequisite course grades, interest, and self-efficacy.. Nine sections of the following courses which offered SI were selected for the study: College Algebra, Elementary Statistics, Elementary Algebra, English Basic Composition and Reading. Voluntary participation in SI ranged from one-third to two-thirds of the classes in the nine course sections. In nearly all the courses both the decision of participate in SI and the number of times that SI sessions attended were found to be statistically significant with higher final course grades. In several sections there were no statistically significant differences between SI and non-SI participants. The preentry attributes of the students did not significantly contribute to higher grades. The researcher made several recommendations for further research including a study of the impact of early participation in SI rather than waiting until later in the academic term. There are no reported studies of SI that have evaluated this variable for its possible impact on student grades in the course.

Bronstein, S. B. (2007). *Supplemental instruction: Supporting persistence in barrier courses.* (Ph.D. dissertation), University of Massachusetts Amherst, Amherst, MA.
The purpose of this single-case descriptive study was to explore student and instructor perceptions of Supplemental Instruction (SI) in an upper-level chemistry course (Physical Chemistry). The course has a reputation for being particularly challenging, an academic hurdle or barrier for students in the science, mathematics and engineering (SME) disciplines. This study provided an opportunity to better understand why students in an advanced "barrier" course participate in SI, and why SI is perceived as an effective resource in upper-level courses. Determining the perceived benefit of SI as a way to overcome these barriers may positively contribute to persistence. In designing this study, the researcher sought to answer two primary questions: (1) Why do students in Physical Chemistry participate in SI; and (2) is SI an effective strategy supporting persistence in SME majors? These questions were explored through a case study methodology that included a focus group, one-on-one interviews with instructors and six enrolled students, document review and class and SI statistics. Findings indicated four major factors that related to students' participation in these SI sessions: (1) anxiety about the course initiated by the reputation of this difficult required course; (2) the course content, complicated by the use of mathematics and composition of the subject matter; (3) characteristics of enrolled students; and (4) nature and benefit of academic resources. The combination of course anxiety and a required course with difficult content generates the cycle of an academic barrier. Results also suggested several interrelated conclusions about the value of SI as an academic resource. SI seemed to reduce anxiety, and supported students' learning. A comparison of course grades before and since the inclusion of SI in Physical Chemistry demonstrated a statistically significant increase in higher grades. This combination of academic success and positive social experiences suggests that SI is a valuable resource for overcoming academic barriers and positively contributing to student persistence.

Bronstein, S. B. (2008). Supplemental Instruction: Supporting persistence in barrier courses. *The Learning Assistance Review, 13*(1), 31-45.
Courses that interfere with undergraduate students' persistence are barriers that appear all along the undergraduate continuum. Supplemental Instruction (SI) may contribute to students' achievement in a barrier course and, therefore, to their persistence in their academic program. The purpose of this single-case descriptive study was to explore student and instructor perceptions of SI in an upper-level chemistry course with a reputation for being a barrier to academic success. The case study methodology used included a focus group, one-on-one interviews with instructors and students, document review, and class and SI statistics. Results indicated that faculty and students perceived SI to be a valuable resource in in achieving persistence or academic success.

Brookshire, R. G., & Palocsay, S. W. (2005). Factors contributing to the success of undergraduate business students in management science courses. *Decision Sciences: Journal of Innovative Education, 3*(1), 99-108.
This article examines the use of Supplemental Instruction (SI) in an introductory management science course that has been historically-difficult within the business school curriculum.This study uses multiple regression to examine the potential usefulness of SI to meet the needs of the students.

Brown, K., Naim, K., van der Meer, J., & Scott, C. (2014). "We were told we're not teachers...It gets difficult to draw the line" Negotiating roles in Peer-Assisted Study Sessions (PASS). *Mentoring & Tutoring: Partnership in Learning*. doi:10.1080/13611267.2014.902559.
Peer learning models in pre-service teacher education are in the early stages of implementation. In this article, we evaluated a pilot Peer-Assisted Study Sessions (PASS) program that supplemented a course for pre-service teachers at one New Zealand university. PASS participants discussed experiences of the program, revealing tensions between what students and facilitators felt should happen in PASS, and how they acted differently. We explained these tensions by considering how social and cognitive congruence operated between students and facilitators. The majority of our peer facilitators were pre-service teachers, suggesting these intersecting roles offered important considerations for reciprocity in near-peer relationships, and joint negotiations of roles and responsibilities. We conclude this article with implications for future training of PASS facilitators, including those training as teachers.

Browning, S., Minkoff, D., Wallace, J., & Zerger, S. (Writers). (1995). The use of Supplemental Instruction for faculty and SI leader development [Videotape]. In D. Arendale (Producer). Kansas City, MO: Center for Supplemental Instruction, The University of Missouri-Kansas City
This videotape records a panel discussion on the uses of Supplemental Instruction (SI) for both faculty and SI leader professional development. Topics covered included: faculty development in the United Kingdom and the U.S.; SI leaders serving as partners with faculty members to improve classroom learning; using SI as an anonymous feedback mechanism for faculty members; and developing a faculty focus on increased student learning. The panelists are campus SI supervisors with the SI program.

Wallace is Certified Trainer for the United Kingdom with Minkoff and Zerger trainers for the U.S.

Bruzell-Nilsson, M., & Bryngfors, L. (1996). *Use of Supplemental Instruction to improve student learning in Sweden*. Paper presented at the International Conference on the First-Year Experience, St. Andrews, Scotland, United Kingdom. (ERIC Document Reproduction Service No. ED398792). .
This chapter in the conference proceedings describes the use of Supplemental Instruction (SI) at postsecondary institutions in Sweden. Both a basic overview of the SI model and adaptions to the SI model for use in Sweden are shared.

Bryngfors, L., & Barmen, G. (2000). *The LTH Program: A structured introductory process to improve first year students' performance and learning*. Unpublished manuscript. The Lund Institute of Technology. Lund, Sweden. Available from the authors: Lund Institute of Technology, PO Box 118, SE-221 OO LUND, Sweden, Leif.Bryngfors@kansli.lth.se
Higher education in Sweden faces many of the same challenge as the rest of Western Europe and the United States. The LTH Program combines an orientation process with a support system to help new students in their transition from secondary school to university studies. Essential components of the program stimulate the learning process of students while encouraging them to find a balance between academic and social activities. Three years experience with the LTH program shows an increase in first-year performance and retention by as much as 50 percent. Supplemental Instruction is a critical component of the LTH program.

Bryngfors, L., & Barmen, G. (2003). The LTH Program -- A Structured introductory process to improve first-year students' performance and learning. *National Association for Student Personnel Administrators Journal, 40*(4), Article 3.
This article focuses on a comprehensive approach to student persistence at the Lund Institute of Technology in Sweden in a manner consistent with Swedish ethos. The explorations led to the development of the LTH (*Swedish abbreviation for Lund Institute of Technology*) program, which combines an orientation process with a support system to help new students in their transition from secondary school to university studies. Essential components of the program seek to stimulate the learning process of students, while encouraging them to find a balance between academic and social activities. Three years experience with the LTH program shows an increase in first-year performance and retention by 50%. Supplemental Instruction (SI) is an important component of the LTH program.

Bryngfors, L., & Bruzell-Nilsson, M. (1997). *Supplemental Instruction: An experimental project with the method of Supplemental Instruction*. Unpublished manuscript. The Lund Institute of Technology and The Faculty of Science. Lund, Sweden.
This report provides an overview of the expansion of the Supplemental Instruction (SI) program into Sweden. Research studies in 1996 from Lund University (Lund, Sweden) suggest that SI participation contributes to higher percent of students passing the final examination for the course (46 percent vs. 39 percent), and a higher rate of

reenrollment (15 percentage points higher). The mean average of students participating in SI was 46 percent. Interviews with SI participants, SI leaders and the course professors who had SI attached to their class reported positive comments concerning the impact of the SI program. SI leader comments could be placed into three categories: contact with and the opportunity to assist in the learning process of the new students; deeper knowledge of the subject; and deeper knowledge of the learning process and leadership experiences. Faculty members mentioned the following reasons for supporting the SI program: received feedback from students concerning problems that students encountered but did not disclose to the course instructor; SI sessions provided another forum for students to engage in deeper understanding and problem solving; students appeared more ready to participate in class oral examinations due to practice of similar activities in SI sessions; students were more skilled in participating in collaborative learning activities required by the course professor; and students appeared to have higher morale since they established working relationships with other students who could support their academic work. The authors for this report also serve as the Certified Trainers for SI in Sweden and surrounding countries.

Bryngfors, L., & Bruzell-Nilsson, M. (1997). Supplemental Instruction: An experimental project with the method of Supplemental Instruction. In R. B. Ludeman & S. Hubler (Eds.), *Quality student services around the world: Bridging student needs and student success* (pp. 221-246). Washington, D.C.: National Association of Student Personnel Administrators
This report provides an overview of the expansion of the Supplemental Instruction (SI) program into Sweden. Research studies in 1996 from Lund University (Lund, Sweden) suggest that SI participation contributes to higher percent of students passing the final examination for the course (46 percent vs. 39 percent), and a higher rate of reenrollment (15 percentage points higher). The mean average of students participating in SI was 46 percent. Interviews with SI participants, SI leaders and the course professors who had SI attached to their class reported positive comments concerning the impact of the SI program. SI leader comments could be placed into three categories: contact with and the opportunity to assist in the learning process of the new students; deeper knowledge of the subject; and deeper knowledge of the learning process and leadership experiences. Faculty members mentioned the following reasons for supporting the SI program: received feedback from students concerning problems that students encountered but did not disclose to the course instructor; SI sessions provided another forum for students to engage in deeper understanding and problem solving; students appeared more ready to participate in class oral examinations due to practice of similar activities in SI sessions; students were more skilled in participating in collaborative learning activities required by the course professor; and students appeared to have higher morale since they established working relationships with other students who could support their academic work. The authors for this report also serve as the Certified Trainers for SI in Sweden and surrounding countries.

Bryson, D. (1987, 1987, March 8). Study sessions help medical students get over the hump of board tests, *Daily American Republic Newspaper,* p. 5.

This newspaper article describes an adaptation of the Supplemental Instruction (SI) model with medical students who are studying to pass their licensure examination so that they may continue with their clinical studies. The article includes interviews with Dr. Robert Blanc, Coordinator of Curriculum Development at the UMKC medical school and Dr. Deanna Martin, Director of the Center for Academic Development. Some of the activities of the semester-length board preparation program mentioned by students interviewed in the article are: students learn how to work in groups to learn new material, students must be able to explain concepts to one another to assure understanding, students focus on the thinking process as much as the content, and students develop confidence in their ability to do well with challenging examinations.

Burmeister, S. L. (1994). The challenge of Supplemental Instruction: Improving student grades and retention in high risk courses. In M. Maxwell (Ed.), *From access to success: A book of readings on college developmental education and learning assistance programs* (pp. 209-214). Clearwater, FL: H&H Publishing Company
This chapter provides a general overview of the Supplemental Instruction (SI) program, its history and components. Review of significant research studies of the SI model is included (e.g., course grade and reenrollment by entry-test score, graduation rates). A new study suggests that SI attendance was correlated with higher final course grades in three types of mathematics courses: College Algebra (2.21 vs. 1.98), Calculus (2.28 vs. 1.83), and Statistics (2.49 vs. 2.32). The study included data from 45 institutions with a total of 11,252 students enrolled in 177 classes. SI participants earned mean final course grades that were higher than non-participants in all three categories of mathematics courses. Suggestions are provided for improving the effectiveness of campus SI programs.

Burmeister, S. L. (1996). Supplemental Instruction: An interview with Deanna Martin. *Journal of Developmental Education, 20*(1), 22-24, 26.
This is the transcript of an interview with Dr. Deanna Martin, creator of the Supplemental Instruction (SI) model. Issues discussed in the interview include: new innovations in the SI model; cost effectiveness of the model; use of SI in other countries; current educational climate in higher education; disagreement with mandatory testing and placement of students into tracked developmental education programs; challenges with lecture-based educational delivery systems with increasing student learning mastery; and future opportunities for use of SI and Video-based Supplemental Instruction

Burmeister, S. L., Carter, J. M., Hockenberger, L. R., Kenney, P. A., McLaren, A., & Nice, D. L. (1994). *Supplemental Instruction sessions in College Algebra and Calculus*. New Directions for Teaching and Learning No. 60. San Francisco, CA: Jossey-Bass.
Based on their observations of math Supplemental Instruction sessions, the authors review several active learning strategies that have been effective for students of the discipline. Critical activities for SI participants include: active involvement by all SI session participants; test their approaches to problems; precise use of math vocabulary; attention to precision; practice solving problems under time constraints; vocalize their thinking process regarding problem solving to each other; and set part of the agenda of

SI sessions. SI leaders need strong support from the SI supervisor for such activities to characterize SI sessions.

Burmeister, S. L., Kenney, P. A., & Nice, D. L. (1996). Analysis of effectiveness of Supplemental Instruction sessions for college algebra, calculus, and statistics. In J. J. Kaput, A. H. Schoenfeld & E. Dubinsky (Eds.), *Research in Collegiate Mathematics Education II* (pp. 145-154). Providence, RI: American Mathematical Association and Mathematical Association of America
After an overview of the Supplemental Instruction (SI) model, this article focuses on a research study concerning the effectiveness of SI for 11,252 students enrolled in 177 courses in college algebra, calculus and statistics from 45 different institutions. In comparison with non-SI participants, SI participants earned higher mean final course grades and experienced lower rates of withdrawals: algebra (2.21 vs. 1.98); calculus (2.28 vs. 1.83); and statistics (2.49 vs. 2.32).

Burmeister, S. L., McLaren, A., & Zerger, S. (Writers). (1995). Supplemental Instruction in the content areas: English, Humanities, and Mathematics [Videotape]. In D. Arendale (Producer). Kansas City, MO: Center for Supplemental Instruction, The University of Missouri-Kansas City
This videotape records a panel discussion on the subtle differences and needs for Supplemental Instruction in different content areas. Topics included: differences in problem-based and vocabulary-based curriculums; use of SI in laboratory situations; strategies for mastering vocabulary; relationships between lectures and textbooks in different content areas; and the degree to which strategies for curriculums overlap with each other. The panelists are all campus SI supervisors as well as Certified Trainers with the SI program.

Bushway, S. D., & Flower, S. M. (2002). Helping criminal justice students learn statistics: A quasi-experimental evaluation of learning assistance. *Journal of Criminal Justice Education, 13*(1), 35-57.
This article describes a quasi-experimental study of the use of Supplemental Instruction (SI) in a statistics course taken by students enrolled in criminal justice and criminology at a large public university. Three other modifications were made in the class: (1) participation in SI was mandatory for at-risk students and voluntary for all others in the class; (2) offering web-based quizzes; and (3) mandatory lecture class attendance for at-risk students. SI and the quizes contributed to increased success of students while the mandatory attendance did not have an apparent effect. The intent of the online quizes was to increase reading of the textbook.

Bye, L. A. (2005). *Student achievement and retention in relation to supplemental instruction provided for two first-year science courses.* (Master of Arts thesis), University of South Dakota, Vermillion, SD.
This research was conducted at the request of university administration to determine if the program was valuable as a tool in retention. Information specifically about the benefit vs. cost at the institution was deemed necessary in order to make budgetary decisions. This study examined differences in mean course grades and term GPAs

based on SI attendance of students enrolled in two first-year college natural science courses. In addition, the relationship between course grades, term GPA, and reenrollment was also investigated. Analyses of variance (ANOVAs) were used to discover differences in students' course and term grade point averages between groups based on attendance level at SI sessions. A Pearson product-moment correlation was conducted to determine the relationship between level of attendance at SI, course grades, and term grade point averages. For subjects in the study, attendance in SI seemed to provide a useful intervention to increase targeted course grades. This examination supports the hypothesis that going to SI sessions on a regular basis produces a significant mean difference of the groups. Course grade averages were significantly higher for students who attended SI more often in comparison to the course grade averages of students who did not attend. Students participating in SI more often also had significantly higher term grade point averages than those who did not attend. A positive correlation was found between attendance at SI sessions and course grade and also between attendance and term GPA. Finally, a chi-square analysis revealed that student attendance at SI sessions had a positive relationship with retention of students in the university.

Campbell, M. L. (1994). *The cognitive effect of Supplemental Instruction on student achievement in general biology.* (Master's of Education thesis), Slippery Rock University, Slippery Rock, PA.
Supplemental Instruction (SI) was studied at Slippery Rock University (PA) with a college-level general biology class. SI participants attended SI sessions twice each week and were compared to a similar group of students who did not participate but had equivalent academic preparation level. The SI group outperformed the control group by half a letter grade, $p<.0285$. Qualitative interview procedures were employed to confirm the effectiveness of SI session attendance with higher final course grades.

Campbell, M. L. (2002). Supplemental Instruction academic assistance within Pennsylvania's ACT 101 Program for disadvantaged students [Dissertation, University of Pittsburgh, 2001]. *Dissertation Abstracts International, 62*(12), 4083.
Supplemental Instruction (SI) is a specialized form of group academic support developed to increase student performance and retention by proactively integrating study skills acquisition strategies into voluntary out-of-class sessions targeting content from high-risk courses (Martin & Arendale, 1993). SI features faculty partnerships, sessions focused upon peer collaborative learning, SI leaders who attend class lectures, and on-going assessment (Martin & Arendale, 1994). To determine how to foster SI academic assistance within programming like Pennsylvania's Act 101 initiative for disadvantaged students, this study determined the differences in perceptions of SI between Act 101 tutorial coordinators with established SI programs and those who may potentially start new SI programs. A self-administered questionnaire was developed by the researcher using current SI literature and mailed to each of the state's Act 101 program tutorial coordinators. Of the 79 subjects, 56 (71%) returned completed questionnaires. Though 27% of the Act 101 tutorial coordinators were unaware of SI, 46% reported familiarity with and usage of the model. Act 101 SI efforts were characterized as small in scale, nascent in development, and lacking many

recommended elements of the SI model (e.g., faculty partnership). Act 101 tutorial coordinators lacking SI programs, yet aware of the potential, tended to underestimate the benefits of such programming like the emphasis on high-risk courses, integration of study skills, and lack of remedial stigma. Moreover, they tended to overestimate the difficulty associated with overcoming challenges to program administration like program costs and recruiting students to SI sessions. However, most Act 101 tutorial coordinators valued similar program characteristics such as promoting student persistence and meeting academic needs as influencing the use of SI. Finally, perceived limitations in program funding, professional supervision, and campus support emerged as the most prevalent issues impeding the expansion of SI within Act 101.

Capstick, S. (2004). *Benefits and shortcomings of Peer Assisted Learning (PAL) in higher education: An appraisal by students*. Unpublished manuscript. Bournemouth University. Bournemouth, United Kingdom. Retrieved from http://pal.bournemouth.ac.uk/documents/Bnfts%20%26%20Shrtcmngs%20%20of%20PAL3.pdf
The benefits and shortcomings of a Peer Assisted Learning (PAL) scheme [based upon Supplemental Instruction] are described from the perspective of its student participants. Qualitative methodology is used to investigate and describe student outcomes, together with an analysis of influence of PAL on marks in one course. A wide range of benefits are reported for students engaged in PAL, as well as for those students responsible for managing PAL discussion groups. PAL leaders improved presentation skills, group speaking, and confidence. Some PAL leaders said the experience helped them during job interviews as well as promoting interest in teaching as a career. Negative aspects of PAL as described by the PAL leaders was the rule that they are not permitted to make short lectures to clear up confusion by the participants. This rule is common among British SI-like programs to clearly define how SI is different than what professional tutors and the course instructor does. It is argued that qualitative benefits of PAL are more pronounced and demonstrable, and more appropriately portray the scheme, than quantitative outcomes.

Capstick, S., Aisthorpe, A., Fleming, H., Haynes, S., & Spiers, M. (2003). *Peer assisted learning in Business Education: Innovative student support with wide-ranging benefits*. Unpublished manuscript. Bournemouth University. Bournemouth, United Kingdom.
Peer Assisted Learning (PAL), an adaptation of the Supplemental Instruction (SI), was used at Bournemouth University (United Kingdom) in the Business School. The manuscript describes the PAL program, short history of the introduction of SI to the United Kingdom, theories of group and individual learning, and operational issues associated with implementing the PAL program. PAL is offered by 80 PAL leaders in 13 courses: computing, conservation sciences, hospitality, business information technology, business information systems management, communication, and law.

Capstick, S., & Fleming, H. (2002). Peer assisted learning in an undergraduate hospitality course: Second year students supporting first year students in group learning. *Journal of Hospitality, Leisure, Sport, and Tourism Education, 1*(1), 69-75.

This article describes the use of Peer Assisted Learning (PAL) in the Management Foundation Course within the School of Services Industries at Bournemouth University (United Kingdom). The PAL program is an adaptation of the Supplemental Instruction (SI) program. The article first provides an overview of the PAL program and how it has been adapted from the SI model for use within the UK education system.

Capstick, S., Fleming, H., & Hurne, J. (2004). *Implementing Peer Assisted Learning in Higher Education: The experience of a new university and a model for the achievement of a mainstream programme.* . Unpublished manuscript. Bournemouth University. Bournemouth, United Kingdom. Retrieved from http://pal.bournemouth.ac.uk/documents/implmntng%20pal%20article61.pdf
The experience of implementing Peer Assisted Learning in Higher Education over a three-year period is described. Developments in methods of implementation are placed in the context of embedding the scheme at an institutional level and conditions for success when setting up such a scheme are proposed. A timetable for effective implementation of PAL over the course of an academic year is put forward, and experiences and recommendations are placed in the context of Ashwin's (2002) model for implementing peer learning schemes.

Carbon, D. (1995, August 1). Universities give peer program top marks, *Courier Mail Newspaper*.
This newspaper article reports on the implementation of Supplemental Instruction (SI) at three postsecondary institutions in Australia (Queensland University of Technology, University of Queensland, and the University of Southern Queensland). Henry Loh, QUT anatomy professor, reported reducing students' failure rate from 20 to 5 percent after the introduction of the SI program. However, he implemented the program more to increase academic performance than to just reduce student failure rates. Barbara Kelly of UQ reports that SI leaders regularly provide feedback to the course professors regarding the comprehension level of the students. At UQ the SI program is being used in biochemistry, microbiology, engineering, chemistry, and law. Kelly requires SI leaders to maintain diaries to record SI session activities, student behaviors, and suggestions to improve the program. SI leaders report improvement of their confidence levels, developed better communication skills, and believed that their employment prospects were improved.

Carr, A. R. (2002). *A study to determine the effect of a university's Supplemental Instruction program on retention.* (Master's of Arts thesis), Northern State University.
The topic to be investigated in this study was whether regular use of Supplemental Instruction (SI) by at risk freshmen students during the fall semester of 2001 at Northern State University (SD) would result in an increase in persistence from the fall semester of 2001 to the fall semester of 2002 when compared to freshmen students who were also at risk but did not regularly use SI. Courses supported by the SI program included Principles of Sociology, History of Western Civilization II, General Chemistry, General Psychology, American Government, and Biology Survey. All students in the study met the income guidelines of federal TRIO programs for designation as at-risk by being economically-disadvantaged and/or first-generation college. To be considered a SI

participant, a threshold was established of attending four or more sessions during the academic term. The results favored the SI participants as they persisted at a rate of 59% as compared with a peer group who persisted at a rate of 52%.

Carroll, D. (1994, 1994, September 13). UMKC to work with South African school, *The Kansas City Star Newspaper,* p. B3.
This newspaper article describes an agreement between the University of Missouri-Kansas City and the University of Port Elizabeth (UPE) in South Africa concerning the Supplemental Instruction (SI) program. UPE has been successfully using the SI program already for one year.

Carson, D., & Plaskitt, N. (1994). *A descriptive study of the attitudes of first year students at the University of Port Elizabeth toward Supplemental Instruction and evaluation thereof.* (Ph.D. dissertation), University of Port Elizabeth, Port Elizabeth, Republic of South Africa.
This dissertation study of Supplemental Instruction (SI) was conducted at the University of Port Elizabeth in the Republic of South Africa. The study examined students' perceptions of the effectiveness of SI in helping them to acquire skills such as critical thinking, essay writing, and reading of textbooks. The study surveyed Sociology and Economics students' perceptions of the values of SI and found that students perceived four main reasons why SI is effective: improvement of learning ability; increased interest in the subject; a forum to meet new friends; and SI leader support. A need for greater structure within SI sessions was offered as the most common response for improvement of SI.

Cerna, O., Platania, C., & Fong, K. (2012). *Leading by example: A case study of peer leader programs at two Achieving the Dream colleges*. (Report). MDRC. Washington, D.C.
MDRC studied the use of Supplemental Instruction and another model at two Achieving the Dream community colleges: Northern Essex Community College and Bunker Hill Community College in Maryland. A qualitative study of key stakeholders at the institution found SI effective: administrators, faculty members, and participating students. Out of class and out of SI session contact between the SI leaders and the participants helped to build motivation and trust for the students to participate. The SI leaders reported personalpersonal, professional, and academical benefits. Also, gifted students selected as SI leaders received payment for services which reduced their stress and need for additional part-time jobs. The role as SI leader may have contributed to some of them considering careers in teaching. It also gave them additional opportunities to be mentored by the professors for whom they served as academic support. Institutional leaders cited the cost-effectiveness of SI, especially when compared with hiring full-time professional staff members.

Cezar, T., & Gordy, K. (1985). *Supplemental Instruction: A model of academic support*. Paper presented at the Midwest Regional Association of Developmental Educators, St. Louis, MO.

This paper describes the use of Supplemental Instruction (SI) with improving academic achievement of students in historically difficult courses.

Chandler, J. (1994, 1994, December 24). Peer guidance tutors: Group study sessions led by 'A' students help some struggling with 'killer' math and science courses at community colleges, *Los Angeles Times Newspaper,* pp. B1, B6.
This newspaper article describes the use of Supplemental Instruction (SI) program in several colleges in the Los Angeles, CA area (Pierce College, Glendale Community College, Cal State Northridge, Pasadena City College, Valley College in Van Nuys). At Pierce College in a biology course 76 percent of the SI participants earned a grade of A, B, or C while the non-SI participants earned a similar grade only 50 percent of the time. Glendale Community College has a large program with 50 SI leaders. A challenge mentioned by administrative leaders some of the SI programs was finding stable funding to continue the program each year. Several interviewees mentioned that the SI program was important for all students, not just the ones in severe academic trouble.

Chen, M.-H. (2004). *The effects of Supplemental Instruction on mathematics education for students in Taiwan.* (Ph.D. dissertation), University of Arkansas, Fayetteville, AR.
The purpose of this study was to examine the effects of Supplemental Instruction (SI) on mathematics education in Taiwan and to understand the relationship between the attendance of SI and the achievement of students in mathematics. The sample for the study was 248 students from two different school systems and two different school districts. The survey was completed from one rural and one urban school in the general high school system and one school in the vocational high school system. Approximate one half of respondents were from tenth grade, and the other half were from the eleventh grade. The descriptive statistics were utilized to analyze the first research question. Attendance of SI by students at the general high school was higher than students of vocational high school. Attendance by students from urban general high school was higher than students from rural general high school. A one-way analysis of variance (ANOVA) was computed for the second research question. Results revealed that instructions from supplemental tutor and from schoolteacher significantly improved the students' math skills more than supplemental instruction from family members and from video-related and drill books supplemental materials, but that instructions from supplemental tutor and from schoolteacher were not significantly different from each other. Additionally, supplemental instruction provided more learning strategies, academic achievement, and competition with peers than providing students' motivation to learn. Paired samples t test and chi-square test were run respectively to analyze the third research question. Results indicated that no significant difference existed between the supplemental tutor and schoolteacher in teaching skills and strategies. Some of the factors were more important than others in the selection of SI. A regression analysis was conducted to examine the last research question. Attending SI to improve math scores, attending SI because of parents' expectation, and attending SI to reduce the anxiety of math learning explained 15% of the variance in receiving math SI, while the predictor variable peer's influence cannot be used to predict attending math SI or tutoring.

Chilvers, L. (2013). Facilitators and barriers to the development of PASS at the University of Brighton. *Journal of Pedagogic Development, 3*(2).
This journal article describes the PASS program at the University of Brighton in the United Kingdom. PASS is a name often used in the United Kingdom to describe programs based on the Supplemental Instruction (SI) model from the University of Missouri-Kansas City. The article provides an overview of the PASS program at the institution and identifies the barriers that had to be overcome in order to implement it. Due to the newness of the program, students had some initial misunderstandings of the approach by some: PASS was remedial, PASS student leaders were expected to reteach material rather than facilitate group processing of it, reliance upon volunteer labor by the program organizers and student leaders, access to classrooms when the PASS sessions are best scheduled, and developing the institutional support for the program. These results are not uncommon to other institutions when first trialing the PASS program and it is anticipated that it will grow through the barriers to have a successful program like others in the U.K.

Christie, R., & Cheah, S. (1995). *Support structures for students in information technology at Queensland University of Technology*. Unpublished manuscript. Queensland University of Technology at Brisbane. Queensland, Australia.
This paper describes the use of Supplemental Instruction (SI) at the Queensland University of Technology (Australia) in information technology courses. Based on qualitative research studies, the following results occurred: 1) SI participants: were appreciative of opportunity to share their academic problems and doubts with someone who had successfully completed the course; 2) SI leaders: improved their skills in leadership, interpersonal communication, problem solving, study and time management; and 3) course instructors: improved their teaching by receiving timely feedback from the students. There was a positive correlation between higher levels of SI attendance and receiving high marks (6 or 7) in the course.

Clark, C. (1997). *Report by the National Centre for Supplemental Instruction Southern Africa at the University of Port Elizabeth*. Unpublished manuscript. University of Port Elizabeth. Port Elizabeth, Republic of South Africa.
This paper describes results from the 1997 Supplemental Instruction (SI) national South Africa survey. Currently 53 tertiary institutions comprising more than 140 faculty and staff members have been trained in use of SI by the Southern African Center for SI based at the University of Port Elizabeth (UPE) in the Republic of South Africa. Continuing technical assistance and professional development workshops are offered by the National Center at UPE for institutions with SI programs.

Clark, C., & Brophy, B. (1995). *Student perceptions of the Supplemental Instruction (SI) programme at the University of Port Elizabeth*. Paper presented at the South African Association for Academic Development Conference, Technikon Free State, Republic of South Africa.
This paper describes the use of Supplemental Instruction (SI) at the University of Port Elizabeth (South Africa). A questionnaire investigated the attitudes of: attenders and non-attenders, regular and irregular attenders, prepared and underprepared students,

humanities and science students, and finally, pass and failures. This paper focuses on prepared and underprepared students. The underprepared students often only attended SI when they had problems in the course. As a group that studied by themselves. The more prepared students found the SI sessions useful due to the use of collaborative learning techniques.

Clark, C., & Koch, E. (1997). Supplemental Instruction for the South African context: A case study at the University of Port Elizabeth. In R. B. Ludeman & S. Hubler (Eds.), *Quality student services around the world: Bridging student needs and student success* (pp. 124-146). Washington, D.C.: National Association of Student Personnel Administrators
This paper describes how the Supplemental Instruction (SI) program was adapted for use at the University of Port Elizabeth (UPE) in the Republic of South Africa. Issues discussed in the paper include: perceptions and academic performance of first year students; diversity in student composition in terms of language, culture and educational background; departments and curriculum developments; and the personal growth of SI leaders. SI is offered to students in 19 departments offering 25 courses in the Faculties of Science, Arts, Law, Economics, Social Science, and Health Science. The SI program is supervised by the Centrex for Organizational and Academic Development (COAD). In a qualitative and quantitative study of students from Fall 1995 SI participants earned higher grades than nonattendees in nearly all courses. Follow up in the other courses suggested that SI was less than effective due to heavy time tabling of the students that precluded their regular attendance in SI sessions. Feedback provided through the SI program led to curricular reform in several courses where many students experienced academic challenges. SI was found to be equally effective for students from racially diverse and academically disadvantaged backgrounds. Faculty development activities occurred when lecturers attended SI leader training workshops and embedded SI session activities inside their traditional classroom presentations. The researchers suggested that participating lecturers changed their lecture style, made changes to the curriculum, and became more sensitive to diversity issues. SI leaders reported changes due to their involvement: reinforced knowledge of the academic discipline; improved personal academic performance; increased their facilitation and interpersonal skills; increased personal self esteem and confidence levels; and increased career opportunities due to skills in group facilitation

Clark, C., & Mallon, P. (1998). *Supplemental Instruction as a tool to improve student success at South African tertiary institutions*. Unpublished manuscript. University of Port Elizabeth. Port Elizabeth, Republic of South Africa.
This unpublished manuscript describes the use of Supplemental Instruction (SI) with students at the University of Port Elizabeth (UPE) and other institutions in the Republic of South Africa. UPE was selected by UMKC to serve as the training and technical assistance center for Africa. To date national workshops have been conducted 14 times with 140 faculty and staff members from 53 tertiary institutions in South Africa. This paper describes the historical development of SI with Historic Black Universities, Historic White Universities, and Technikons/Colleges. Often the SI program is located within the academic development unit. It is common that SI programs have been

introduced to redress inequalities in academic preparation by the newly admitted students from widely diverse ethnic backgrounds and academic preparation levels.

Clark, L. R. (1997). *Outcomes of Supplemental Instruction for History 1310 and 1320 at Southwest Texas State University.* (Masters of Arts thesis), Southwest Texas State University, San Marcos, TX.
This study sheds light on the effectiveness of Supplemental Instruction (SI) in achieving student academic goals, enhancing student performance in difficult entry level college classes and impacting the success of students with varying abilities between Fall 1995 and Spring 1997 at Southwest Texas State University in History 1310 and History 1320. SI participants out-performed non-SI participants on the three academic outcomes examined: final course grades (mean grade difference: 2.91 vs. 2.17 and rate of A, B, or C: 95.5% vs. 73.3%), D or F course rates (18.9% vs. 37.0%), and institutional persistence (81.1% vs. 63.0%). SI attendance was defined as attending five or more times during the academic term. SI was equally effective with general (2.91 vs. 2.17), non-traditional (2.89 vs. 2.44) and part-time (2.78 vs. 1.90) populations. This research also indicated minority students participated in SI in greater proportions than non-minority students. A significant cross-over or repeat SI population was found. This research concluded that participation in SI result in higher final course grades and successful course completion; the resulting grade improvement is reflected in improved retention (84.2% vs. 72.6%). The researcher noted that the impact of SI may be understated due to analysis of entry level characteristics of the students that suggest that the SI participants tend to be less academically prepared than the non-SI participants (lower high school rank and SAT scores).

Clulow, V. (2000). An analysis of a peer tutoring experience in a first-year business subject. *Journal of Institutional Research, 9*(1), 89-99.
This article describes a study of the use of Supplemental Instruction (SI) in an introductory business course in Australia called statistics for marketers .This study focused on the students' perceptions of the influence of SI as a learning strategy. Positive outcomes for the participating students included:freer flow of questions about the course material, less inhibition to participate in the discussion, greater confidence that they problems were not isolated, better understanding of the course material, environment to express their questions in an unhurried manner and know that they were heard, and finally the opportunity to work through a problem until they had understood it.

Clulow, V. G. (1998). *Supporting student learning in high risk university subjects and the interrelationship to effective subject teaching: An analysis of a peer tutoring experience.* (Master of Arts thesis), University of Melbourne, Parkville, Victoria. Retrieved from http://eprints.infodiv.unimelb.edu.au/archive/00000231/
This dissertation is concerned with the detailed accounts of 21 students who participated with Supplemental Instruction (SI) in a Statistics for Marketers course. The focus of the qualitative research design was how can students' critical awareness of their learning experience while participating in an SU group, inform the teaching practice in universities, at a time when the institution is facing difficult challenges. The critical findings from the study were that: students were highly sensitive to factors that

influenced the effectiveness of their learning, and these included: class size, workload, learning effectiveness in class time and opportunity for participation in classes. SI was found to be significant for improving student involvement in the course that resulted in higher academic outcomes for the students. Students found that SI enabled guide learning from a subject 'champion'. symmetry in the teaching/learning communication, an effective use of learning time and the opportunity to work in small groups.

Cobb, R. (1997). Learning is the lesson: Center illuminates path to understanding. *Illinois State Scholar, 7*(1), 16-17.
This article describes the University Center for Learning Assistance at Illinois State University (Normal, IL). In an interview with Julia Visor, acting director of the center, an overview of the Supplemental Instruction (SI) program at the university is provided. During the Spring 1997 semester, SI was offered to students enrolled in Chemistry and Society, General Psychology, Principles of Microeconomics, Principles of Macroeconomics, Introduction to Non-Western Politics, American Government and Politics, History of the United States to 1865, and Human Biology. Some of the SI participants include students in Student Support Services, one of the federally-funded TRIO programs. A short summary of several research studies concerning SI's impact on affective variables conducted by Visor and others is shared.

Coe, E., McDougall, A., & McKeown, N. (1990). Is Peer Assisted Learning of benefit to undergraduate chemists? *Chemistry Education, 3*(2), 72-75.
This article describes the benefits of Supplemental Instruciton at a U.K. institution.

Coe, E. M., McDougall, A. O., & McKeown, N. B. (1999). Is peer assisted learning of benefit to undergraduate chemists? *University Chemistry Education, 3*(2), 72-75.
Peer Assisted Study Sessions (PASS), based on Supplemental Instruction (SI), was implemented at the University of Manchester (UK) Chemistry Department in 1995 for first-year courses. About half of students enrolled in the classes where PASS is offered participate in the program. The drop out rate was reduced by half after the introduction of PASS (from 20% to 10%). PASS Leaders also reported advantages for their participation including their communication skills.

Cole, K. (2013). PAL experience. *Journal of Pedagogic Development, 3*(2).
This journal article is the personal story of a student study group leader from the University of Bedforshire in the United Kingdom that was involved with the campus PAL program. PAL is a common name in the United Kingdom for programs based on the Supplemental Instruction (SI) model from the University of Missouri-Kansas City. The author provides a unique perspective by the person who is actually delivering the program to the students. The student PAL leader describes her nervousness in preparing for the PAL sessions, the manner in which the students interacted within them, and her perception of the overall program.

Collins, N., & Ronaldson, A. (1995). *Supplemental Instruction: Its effectiveness within the ambit of the Social Work Department of the University of Port Elizabeth.* (Ph.D. dissertation), University of Port Elizabeth, Port Elizabeth, Republic of South Africa.

This dissertation examines the effectiveness of Supplemental Instruction (SI) at the University of Port Elizabeth in the Republic of South Africa. This study replicates findings from a dissertation by Carson and Plaskitt (1994) from the same institution. Two additional reasons were identified by Collins and Ronaldson concerning reasons for the effectiveness of SI: easy participation in SI sessions and adjustment to university life. They concluded that the focus of SI correlates with the needs of students and that SI has helped students to develop important skills, for example, understanding key concepts, lecture note taking, understanding the textbooks and exam preparation. Depending upon the structure of the course, SI participants reported wanting varying levels of structure during the SI sessions. Some students wanted open agendas for the group to select the areas covered and processes used. Other students reported wanting more structure in the SI sessions from the SI leader.

Collins, W. (1982). Some correlates of achievement among students in a Supplemental Instruction program. *Journal of Learning Skills, 2*(1), 19-28.
This article examined the effectiveness of Supplemental Instruction (SI) at Cornell University by comparing the course-grade earned in four subjects (chemistry, mathematics, biology, and physics) and the GPA of 301 students enrolled in these courses with College Board Scholastic Aptitude Scores (Verbal and Math), assistance requested by the student, and high school rank. Even when SAT-scores and high school rank are held constant as in the standard multiple regression procedure used with this study, the results suggest that SI attendance made a significant contribution to the academic achievement of SI participants both with the individual course (Biology, Chemistry Mathematics) and the overall cumulative GPA. The research suggested when comparing students of equivalent SAT scores and high school rank, the following predictions would be warranted, SI participants would receive the following higher grades when compared with the non-SI counterparts: one full letter grade higher in Biology; three-fourths of a letter grade higher in Mathematics; and one-half letter grade higher in Chemistry. There were no predictive variables regarding final course grades in physics. The authors suggest that the strategies learned in SI are transferred to other courses and help improve academic achievement in those courses as well. The SI program is aimed at students admitted to Cornell through the Committee on Special Education Projects (COSEP). Most of these students are members of ethnic groups or from disadvantaged backgrounds.

Commander, N. E., Callahan, C. A., Shatton, C. B., & Smith, B. D. (1997). *Adjunct courses and Supplemental Instruction: A ten step workshop.* Conference Proceedings of the National Association for Developmental Education, Volume 3, Denver, CO. Retrieved July 1, 2004, from http://www.nade.net
At Georgia State University there has been a transition from focusing on developmental courses for some to offering learning support for all students. The authors provide ten questions that can guide an institution as they consider offering Supplemental Instruction (SI) and adjunct courses. In 1996 the institution was offering SI in 28 course sections will a combined enrollment of 3,900 students. About one-third of the students participated in SI sessions. SI participants earned between one half to a full letter grade higher in comparison with similar non-SI attendees. The ten questions that the authors

suggest when designing a new learning support program are: 1. What makes your campus unique? 2. What population do you wish to serve? 3. What courses will you target? 4. How will you build faculty support? 5. How will you market your program? 6. How will you design your curriculum? 7. What results will you share with colleagues in your institution? 8. What results will you share with colleagues outside your institution? 9. How will you secure campus resources? 10. What problems are unique to your situation and what are possible solutions?

Commander, N. E., & Smith, B. D. (1995). Developing adjunct reading and learning courses that work. *Journal of Reading, 38*(5), 352-360.
This article explores a variation of the Supplemental Instruction (SI) program to provide more time for students to develop reading and learning strategies. Rather than using the voluntary peer facilitated study review sessions based on the SI model, the learning assistance center at Georgia State University (Atlanta, GA) chose to create an adjunct course model. Like the SI model, a historically-difficult content course (History 113) was paired with an adjunct course (Learning Strategies for History or LSH). Students enrolled in both courses. Unlike SI, most students enrolled in the strategies courses were developmental. The LSH required students to apply the learning strategies to the companion History 113 course. Considering that the LSH students were less prepared academically than the general student population in the History 113 course, data suggests that the adjunct course was helpful since three quarters of the students passed the History 113 course with a final course grade of C or higher and their mean final course grade (2.3) with nearly the same as the other students (2.5). One of the recommendations for potential adopters of this model is that all students in the LSH course be enrolled in the same section of the content course (e.g., History 113). Failure to do so creates confusion in the LSH course if there are multiple sections of the content course with professors who may be teaching at with different rates, textbooks or content material.

Commander, N. E., Stratton, C. B., Callahan, C. A., & Smith, B. D. (1996). A learning assistance model for expanding academic support. *Journal of Developmental Education, 20*(2), 8-10, 12, 14, 16.
This article provides a model for expanding the role of academic support in higher education. A learning program that formerly offered primarily developmental classes and a tutorial center later expanded to include course-related services of Supplemental Instruction (SI) and adjunct courses at Georgia State University (Atlanta, GA). During Fall 1993 a study in Political Science 101 suggested that SI was correlated with higher mean final course grades (2.7 for regular SI attenders, 2.4 for occasional attenders, and 1.9 for non-SI attenders). The authors suggest ten steps for expanding academic support: 1) consider campus uniqueness; 2) identify population; 3) identify courses; 4) build faculty support; 5) staff adjunct courses with seasoned faculty and SI learning sessions with thoroughly trained leaders; 6) market programs at several levels; 7) provide feedback to the professor of the content course throughout the quarter or semester; 8) involve the administration; 9) keep records; and 10) disseminate information.

Congos, D. H. (1993). A model for Supplemental Instruction in Introductory Chemistry. *Supplemental Instruction Update*, 1, 3.
This article describes the use of Supplemental Instruction (SI) at The University of North Carolina at Charlotte in Introductory Chemistry courses. Four suggestions are made for problem solving activities: 1) SI leader models problem solving steps; 2) SI participants verbalize and write down the steps to solve the problem and how they arrived at their answers; 3) students ask each other questions during the problem solving process; 4) rules for solving the problem are written on the black board; 5) students work by themselves to solve similar problems; 6) students work on recognizing problem types; 7) SI leaders facilitate the discussion process of the students; 8) each step in the problem solving process is identified and numbered; and 9) students continue to practice on problems till they master the process.

Congos, D. H. (1997). *Supplemental Instruction models for introductory chemistry and physics*. Unpublished manuscript. Central Piedmont Community College. Charlotte, NC.
This paper provides several models for Supplemental Instruction (SI) leaders to use when facilitating sessions in introductory chemistry and physics courses. Problem-solving activities are essential for students enrolled in these courses since many of them are unable to recognize problem patterns and the needed procedures to solve them. In chemistry the following seven steps often are needed: 1) read the problem; 2) rewrite the problem in students' own words; 3) write down what the student is trying to find; 4) list the tools that are given for solving the problem; 5) do factor labeling; 6) check the answer in the book for correctness; 7) if the students' answer is incorrect, return to step #3.

Congos, D. H. (2001). How Supplemental Instruction (SI) generates revenue for colleges and universities. *Journal of College Student Retention: Research, Theory, & Practice, 3*(3), 301-309.
The writer discusses how supplemental instruction (SI) can generate revenue for higher education institutions. He shows how SI can create retained tuition revenue far beyond the costs of an SI program in both state-supported and private colleges and universities and notes that SI reduces recruiting costs and retains incoming tuition dollars for longer time periods, supplements the quality of the educational experience, and has the potential to affect an institution's fund-raising efforts. He presents formulas that can be used to determine the amount of retained revenue that can be generated by SI for individual colleges.

Congos, D. H. (2002). How Supplemental Instruction stacks up against Chickering's 7 principles for good practice in undergraduate education. *Research and Teaching in Developmental Education, 19*(1), 75-83.
This article discusses the Supplemental Instruction (SI) model and compares it with Chickering's 7 Principles for Good Practice in Undergraduate Education. SI shares many of the same outcomes cited by Chickering such as: increased student persistence towards graduation, higher final course grades, improved thinking and study skills, and higher satisfaction with the college experience.

Congos, D. H. (2003). Health checklist for Supplemental Instruction (SI) programs. *The Learning Assistance Review, 8*(2), 29-45.
This article provides a checklist of recommended policies and practices for Supplemental Instruction (SI) programs. The document provides a means for conducting a program review with 90 recommended practices. The categories covered by the evaluation tool include: SI leader pre-semester training, SI faculty training, SI leader training during the academic term, SI session observation and feedback, in-class introduction of SI, end-of-term evaluation,

Congos, D. H. (2003). Is Supplemental Instruction (SI) help helpful? *Research & Teaching in Developmental Education, 19*(2), 79-90.
This article explores the issue of the "helpfulness" of Supplemental Instruction (SI) sessions for students. Does participation in SI programs lead to independent learning by students, or are they dependent upon the help of the group for academic achievement? Key factors in the theoretical framework cited by the author for developing independent learners are: reciprocal trust, cooperative learning, mutual growth, reciprocal openness, shared problem solving, non-directive modeling, autonomy, and experimentation.

Congos, D. H., & Bain, D. W. (2001). A board work and note formatting model for learning mathematics coursework using writing. *The Learning Center Newsletter*. Retrieved from http://www.learningassistance.com/2001/Jul01/index.htm.
This article presents a model for teaching math that illustrates the value of using writing within a step-by-step approach to help students understand and learn math solutions. This process was adapted for use with Supplemental Instruction (SI) sessions in mathematics and other problem-solving courses.

Congos, D. H., Langsam, D. M., & Schoeps, N. (1997). Supplemental Instruction: A successful approach to learning how to learn College Introductory Biology. *The Journal of Teaching and Learning, 2*(1), 2-17.
This article reviews the use of Supplemental Instruction (SI) at the University of North Carolina at Charlotte with students enrolled in Introductory Biology (Biology 1110), the first course of a two semester introductory biology sequence for non-majors. The data from Fall 1990 and Spring 1991 suggests that participation in SI has a positive impact on student academic performance. The final score for the SI participants was higher (Fall 1990: 2.72 vs. 1.94; Spring 1991: 2.83 vs. 1.95); the rate of A, B and C final course grades was higher (Fall 1990: 86.3% vs. 65.4%; Spring 1991: 78.6% vs. 62.5%); and the rate of D, F and course withdrawals was lower (Fall 1990: 13.7% vs. 34.6%; Spring 1991: 21.4% vs. 37.5%). A variety of additional statistical tests were conducted to test for the intervening nature of other variables (e.g., SAT verbal, SAT quantitative, SAT sum of SATV and SATQ, high school rank, predicted grade point average before matriculation based on SAT verbal and quantitative). After these additional tests, participation in SI was still found to be statistically significant.

Congos, D. H., & Mack, A. (2005). Supplemental Instruction's impact in two freshman chemistry classes: Research, models of operation, and anecdotes. *Research & Teaching in Developmental Education, 21*(2), 43-64.
Supplemental Instruction (SI) was used at the University of Central Florida to improve student academic performance in several chemistry classes. In addition to the evaluations study, the article provides an overview of the five modes of operation that occur during SI sessions: build complete and accurate lecture and text notes; formulating potential exam questions and answers; build complete and accurate steps in solutions to problems; practice with sample exam; and finally conduct a post-test review to evaluate performance and make behavior modifications for the next exam. Extensive data records were collected to compare student performance in the course both before and during the time of the academic intervention. Significant shifts of student grades in a positive direction occurred after introduction of SI to the introductory chemistry courses. Data was run twice, once comparing SI participants and nonparticipants. A second time it was run with SI participation defined as attending five or more sessions during the term. In both cases, SI attendance was a significant factor in higher grades. When analyzing students who attended five or more times, there was a dramatic drop in the DFW rate and an increase by nearly a full letter grade in final course grade achievement for these SI participants.

Congos, D. H., McLaren, A., & Visor, J. N. (Writers). (1995). Clinical supervision of Supplemental Instruction sessions [Videotape]. In D. Arendale (Producer). Kansas City, MO: Center for Supplemental Instruction, The University of Missouri-Kansas City
This videotape records a discussion by a panel regarding various issues related to supervision of the Supplemental Instruction program: role of the Assistant SI Supervisor; components of a clinical supervision protocol; the limit of capacity for supervision; mentoring and evaluation in clinical supervisory debriefing sessions; and protocol for debriefing SI sessions. The panelists are campus SI supervisors as well as Certified Trainers with the SI program.

Congos, D. H., & Schoeps, N. (1993). Does Supplemental Instruction really work and what is it anyway? *Studies in Higher Education, 18*(2), 165-176.
The authors describe the Supplemental Instruction (SI) program as it operates at the University of North Carolina at Charlotte from 1987 to 1990. The initial portion of the article provides a general overview of the SI program. The Fall 1988 research study suggested that SI participation was positively correlated with higher mean final course grades (2.391 vs. 1.894) and lower withdrawals (17.7% vs. 37.9%). These favorable results are so in spite of the fact that SI attendees enter college with lower predicted academic potential.

Congos, D. H., & Schoeps, N. (1994). Does Supplemental Instruction really work and what is it anyway? *Educational Administration Abstracts, 29*(1), 52-53.
This is a short summary of the authors article -- Does Supplemental Instruction really work and what is it anyway? -- that originally published in the British journal of Studies in Higher Education (1993), vol. 18, no. 2, pp. 165-176. The authors describe the Supplemental Instruction (SI) program as it operates at the University of North Carolina

at Charlotte from 1987 to 1990. The Fall 1988 research study suggested that SI participation was positively correlated with higher mean final course grades (2.391 vs. 1.894) and lower withdrawals (17.7% vs. 37.9%).

Congos, D. H., & Schoeps, N. (1997). A model for evaluating retention programs: Data from a Supplemental Instruction program. *Journal of Developmental Education, 21*(2), 2-4, 6, 8, 24.
This article presents a step-by-step model for analyzing the impact of retention programs on students. Data from a Supplemental Instruction (SI) program is used to demonstrate how this research is done. The seven steps include: identify the relevant variables; for each student in the class, gather the data on the independent variables chosen in Step 1; maintain on-going data on the information needed for the dependent variables; enter the data into a computer in an organized format that eases analysis; define the criteria that determines who is an attendee or participant; analyze the data using an appropriate data analysis software package; and set up the results in a readable manner, including relevant narratives necessary to explain and clarify the data. To illustrate the seven-step method, the researchers analyze the SI data from their campus regarding improved final course grades, reduction of D/F/W, and projected cost savings.

Congos, D. H., & Schoeps, N. (1998). Inside Supplemental Instruction sessions: One model of what happens that improves grades and retention. *Research & Teaching in Developmental Education, 15*(1), 47-61.
After providing an overview of the Supplemental Instruction (SI) model, the authors describe three basic modes of operation in SI sessions: 1) building complete and accurate lecture notes; 2) formulating possible examination questions and answers; 3) conduct post examination survey. The cost effectiveness of the SI program was calculated on the basis of increased retention rates of SI participants. A study was conducted at the University of North Carolina at Charlotte with students enrolled in Introductory Biology (Biology 1110), the first course of a two semester introductory biology sequence for non-majors. The data from Fall 1990 suggests that participation in SI has a positive impact on student academic performance. The final score for the SI participants was higher (2.59 vs. 1.94); the rate of A, B and C final course grades was higher (86.3% vs. 65.5%); and the rate of D, F and course withdrawals was lower (13.7% vs. 34.5%). A variety of additional statistical tests were conducted to test for the intervening nature of other variables (e.g., SAT verbal, SAT quantitative, SAT sum of SATV and SATQ, high school rank, predicted grade point average before matriculation based on SAT verbal and quantitative). After these additional tests, participation in SI was still found to be statistically significant.

Congos, D. H., & Schoeps, N. (1999). Methods to determine the impact of SI programs on colleges and universities. *Journal of College Student Retention: Theory, Research, & Practice, 1*(1), 59-82.
This article presents three categories of approaches to assess the impact of Supplemental Instruction (SI) on an institution: anecdotal information, descriptive statistics, and inferential statistics. For SI programs required to justify their existence,

the methods in this article presents assessment devices from simple testimony to rigorous inferential statistical data.

Congos, D. H., & Schoeps, N. (2003). Inside Supplemental Instruction sessions: One model of what happens that improves grades and retention revisited. *Journal of Student Centered Learning, 1*(3), 161-172.
This article is a revision of one earlier published earlier by the authors: *Research and Teaching in Developmental Education, 15*(1), 47-61. The first section of the article is devoted to an overview of the Supplemental Instruction (SI) model. The next part provides a financial cost-benefit analysis of the economic return of the SI program due to it contributing to higher student persistence. The authors describe five types of activities that occur inside of SI sessions: note building, question/answer, problems and solutions, sample test, and post-test survey. A study was conducted at the University of North Carolina at Charlotte with students enrolled in Introductory Biology (Biology 1110), the first course of a two semester introductory biology sequence for non-majors. The data suggests that participation in SI has a positive impact on student academic performance. The final score for the SI participants was higher (2.59 vs. 1.94); the rate of A, B and C final course grades was higher (86.3% vs. 65.5%); and the rate of D, F and course withdrawals was lower (13.7% vs. 34.5%). A variety of additional statistical tests were conducted to test for the intervening nature of other variables (e.g., SAT verbal, SAT quantitative, SAT sum of SATV and SATQ, high school rank, predicted grade point average before matriculation based on SAT verbal and quantitative). After these additional tests, participation in SI was still found to be statistically significant.

Congos, D. H., & Stout, B. (1997). The benefits of Supplemental Instruction (SI) leadership experience after graduation. *Research & Teaching in Developmental Education, 29*(1), 29-41.
The benefits of Supplemental Instruction (SI) for the students who facilitate the sessions is described in this article. The authors used an open ended survey instrument to gather data from former SI leaders for this study. Participating institutions in the study included the University of Pittsburgh, Central Florida University, and Palm Beach Community College. Responses gathered through the survey were categorized into the following categories: interpersonal relations skills, learning skills, leadership skills, work related skills, content knowledge, and other. The most frequently cited benefit of serving as a SI leader was the improvement of personal interpersonal communication skills.

Congos, D. H., & Stout, B. M. (2001). Twenty FAQ's from faculty about Supplemental Instruction programs. *Research & Teaching in Developmental Education, 18*(1), 41-49.
As experienced Supplemental Instruction coordinators, we regularly field a variety of questions from faculty about the SI program. This is anticipated since SI is attached to their courses and they have a natural vested interest in the SI program and the impact that it has on student achievement and satisfaction with the course which potentially can affect student evaluations for the course professor. Many of these questions are expected and not difficult to address. The paper lists twenty of the most frequently asked questions.

Conroy, G. J. (1996, 1996, May 28). Supplemental Instruction program shows results first year, *The Observer Newspaper,* pp. 3-4.
This newspaper article describes the use of Supplemental Instruction (SI) at Southern Illinois University at Edwardsville. SI sessions were offered in an introductory biological sciences course (Biology 120). The article indicated one of the SI program benefits was that SI leaders who were biology education majors learned pedagogical methods. The SI supervisor reported a preference for hiring education majors. According to data from Fall 1995 in Biology 120, SI participants to attended four or more sessions earned a mean grade of a low B, whereas those who attended one to three sessions averaged a C. Those who did not attend any SI sessions averaged a D.

Corey Legge, K. P. (2010). *Does mandatory Supplemental Instruction work in developmental math education? A study of students enrolled in developmental math courses at a suburban community college in the Northeast.* (Ed. D. dissertation), Temple University, Maryland.
The number of students entering the community college in need of developmental math has not changed, remaining at a steady 60% over the past seven years. This study compared the success rate of Mandatory Supplemental Instruction (MSI) sessions within four sections of a developmental math course compared with the success rates of students enrolled in both the Traditional Classroom setting and the Individualized format at Suburban Community College (SCC) during the Fall 2009 semester. These MSI format courses were compared with both the Individualized format of MAT 060 and the Traditional Classroom format of the same course. The students included in these sections were a combination of students who were: (1) suggested by advisors to enroll in this developmental math course after receiving a low score on the college's Accuplacer placement test for algebra or continuing the progression of developmental math from the lower level arithmetic class; (2) mandated to attend MSI after successful completion of the Jump Start Math Program, or (3) self-selected into the MSI group anticipating the need for additional help in the course. The two primary data sets available for this study are student math final grades and student participation/attendance records. Secondary sets of data include informal focus group notes, final exam scores, student attendance records for both class lectures and MSI sessions, and Supplemental Instruction Leader anecdotal records. The findings of this study conclude that success rates of students enrolled in the MSI sections of developmental math do not differ significantly from those enrolled in the Traditional Classroom format of developmental math; however, both groups did differ significantly from the Individualized format of developmental math, in that the students enrolled in the Individualized format succeeded at a lesser rate and withdrew at a greater rate than their MSI or Traditional Classroom counterparts. This study also concluded that female, full-time students succeeded at a greater rate across the board, which is consistent with the literature. These findings were significant for a number of reasons. Although the difference between the treatment group and the Traditional Classroom group was not significant, there are a variety of reasons at the program level as to why this may have been so and there are many future constructs that SCC can put in place to strengthen and reassess the MSI program. Although this study was focused on the MSI treatment,

the data revealed a greater issue existing in the Individualized format of developmental math at SCC. Future considerations can be made in this particular delivery method to improve success rates of students involved in this program. Future research on MSI in the form of persistence and retention rates, graduation rates, transfer rates, subsequent math course grades and success in other college-level classes can be explored to provide the MSI program with more data to determine if particular groups of students are benefiting from this format.

Costanza, M. N., Leibrecht., B. C., Cooper, W., & Sanders, W. R. (2009). *Peer-to-peer training facilitator's guide: Development and evaluation. Research Report 1911*. (Report). U. S. Army Research Institute for the Behavioral and Social Sciences. Arlington, VA. Retrieved from http://dbaconsultinghq.com/wp-content/uploads/2011/11/Research-Report-1911.pdf
The research involved 1) a review of the literature and training practices to identify best practices for P2P training 2) the development of the Facilitator's Guide which provides a framework for developing, delivering, and assessing P2P training, and 3) the formative evaluation of the Facilitator's Guide by representative Army officers. The review of training practices included interviews with experienced P2P facilitators, observations of the learning activities present in Battle Command Knowledge System (BCKS) and Stryker Symposiums, and participation in a Supplemental Instruction Workshop at the University of Missouri-Kansas City. The Facilitator's Guide was developed through a process of cross-walking P2P training principles against the requirements to develop, deliver, and assess training. A formative evaluation of the Facilitator's Guide was conducted with representative Army officers participating in peer group discussions in both face-to-face and video teleconference environments. Findings: Results indicated that Army officers benefited from the knowledge exchange during the P2P training sessions, with the majority commenting on the constructive value of the guide and the effectiveness of the P2P training sessions. Feedback on the guide was mostly positive with facilitators indicating that the guide provided an appropriate amount of information and a usable format and tools for structuring and promoting group discussions.

Couchamn, J. A. (1997). *Supplemental Instruction: Peer mentoring and student productivity.* Conference Proceedings of the Researching education in new times, Brisbane, Toowoomba, Australia. Retrieved from http://www.aare.edu.au/97pap/coucj521.htm
The Supplemental Instruction (SI) program was implemented in a first year accounting subject (51002: Introduction to Accounting) in the Faculty of Commerce at the University of Southern Queensland (Australia). The results, in both quantitative and qualitative terms supported the utility of SI regarding student achievement and higher institutional revenue. While the failure rate did not change between the control and treatment groups, the rate of final course grades of high distinction tripled. SI Leaders reported increases in both their communication and leadership skills.

Couchman, J. A. (1997). *Report on the pilot study of the Supplemental Instruction program: 51002 Introduction to Accounting*. Unpublished manuscript. University of Southern Queensland. Toowoomba, Queensland, Australia.

A 1997 research study at the University of Southern Queensland (Toowoomba, Queensland, Australia) involved all enrolled students in Introduction to Accounting (51002). By use of the external student cohort as a control group, it was claimed by the researchers that Supplemental Instruction resulted in a positive impact on the overall pass rate for the unit, raising it from 39% in 1996 to 55% in 1997. SI participants averaged 1.15 of a grade point higher on a 7 GPA scale than non-participants. SI participants were: only one-third as likely to fail; nearly four times more likely to gain an HD, approximately equally likely to gain an A grade; over twice as likely to gain a B grade; and three-quarters as likely to gain a C grade than non-participants. When examining a subpopulation of international students, they had a 78% pass rate compared with 48% for those international students who did not participate.

Couchman, J. A. (1999). *Distance PALS in real and virtual classes.* Conference Proceedings of the First National Conference on Supplemental Instruction and Video-based Supplemental Instruction, Kansas City, MO.
As a major provider of distance education programs in Australia, the University of Southern Queensland has a unique interest in the development of flexibly delivered and supported distance education study programs. In 1996, to enhance the success and retention of its distance education students, the Distance PALS (Peer Assisted Learning Sessions) program was developed on the basis of the Supplemental Instruction program. During semester one, 1997 and 1998, it was implemented and evaluated in a first year foundation economics course in selected off-campus study centers. The quantitative and qualitative data collected confirm the success of the PALS program and indicate modification to further enhance its success. Attendees received a difference of 0.96 on a seven point scale higher score and were twice as likely to pass the course.

Couchman, J. A. (2001). Peer-assisted teaching and learning in distance education. In J. E. Miller, J. E. Groccia & M. S. Miller (Eds.), *Student-assisted teaching: A guide to faculty-student teamwork* (pp. 110-115). Bolton, MA: Anker Publishing Company. Retrieved from ERIC database. (ED449713).
As a major provider of distance education programs in Australia, the University of Southern Queensland has a unique interest in the development of flexibly delivered and supported distance education study programs. In 1996, to enhance the success and retention of its distance education students, the Distance PALS (Peer Assisted Learning Sessions) program was developed on the basis of the Supplemental Instruction program. During semester one, 1997 and 1998, it was implemented and evaluated in a first year foundation economics course in selected off-campus study centers. The qualitative data collected confirm the success of the PALS program and indicate modification to further enhance its success. Attendees received a difference of 0.96 on a seven point scale higher score and were twice as likely to pass the course. The program was cost effective based on the higher persistence rate of students.

Couchman, J. A. (2009). An exploration of the 'lived experiences' of one cohort of academic peer mentors at a small Australian university. *Australasian Journal of Peer Learning, 2*(1), 87-110. Retrieved from http://ro.uow.edu.au/ajpl/vol2/iss1/5.

While the benefits of Supplemental Instruction (SI) have been widely reported, the benefits for the SI leaders involved with the program have not. After a literature review of previous research efforts with investigating this issue, the article describes a qualitative study with 11 undergraduate SI leaders at a university in Australia. Themes that emerged from the research include: empathy, collaborative techniques, inclusiveness, reflective practice, mutuality, increased learning, growing confidence, developing communication skills, establishing friendships, and other results.

Couchman, J. A. (2009). *Report on a Pilot Study of the Peer Assisted Learning Sessions (PALS) program: Introduction to Information Technology (4478) Semester 1, 2009*. Unpublished manuscript. University of Canberra. Bruce, Australia.
In semester 1, 2009, with the support of unit convener of Introduction to Information Technology, the PALS program was implemented as part of a suite of student success and retention initiatives. Recently students enrolled in Introduction to Information Technology had recorded lower than acceptable pass rates. PALS was considered to be an appropriate program to provide student support because of its proven effectiveness with higher education student success and retention both overseas and in Australia over a number of years. Students from all GPA levels attended at least one PALS. PALS intervention resulted in a positive impact on the final grades of students who attended, regardless of GPA. The data showed that improvement of 11.8% in the nett pass rate compared with that of semester 1, 2008 · students who attended PALS frequently (more than four times) had better DI and CR rates than either occasional or non-attendees · students who attended PALS frequently had a lower fail rate than that of other students · low UAI students who attended PALS had a pass rate one-third higher than that of those who did not attend. Student feedback on PALS through an end of semester questionnaire was positive and indicated that PALS had enhanced respondents' revision, exam preparation and assignment preparation and over 90% would recommend PALS to other students. The efficacy of PALS as implemented in this unit has been demonstrated.

Couchman, J. A., & Pigozzo, R. (1997). *Report on the Supplemental Instruction program: 51008 Economics*. Unpublished manuscript. Unpublished manuscript, University of Southern Queensland. Toowoomba, Queensland, Australia.
This 1997 Supplemental Instruction (SI) study was conducted at the University of Southern Queensland (Toowoomba, Queensland, Australia) in the 51008 Economics course. SI participants averaged 0.83 of a grade point higher on a 7 GPA scale than non-participants. The results suggested that only one-fifth of SI participants were likely to fail; one-third more likely to gain an HD, two and a half times more likely to gain an A grade; twice as likely to gain a B grade; and over one and a half times as likely to gain a C grade than non-participants. International students who attended SI sessions regularly had a 93% pass rate compared with 63% for those international students who chose not to attend regularly.

Couchmann, J. A. (2008). Who am I now? Accommodating new higher education diversity in Supplemental Instruction. *Australasian Journal of Peer Learning, 1*, 80-90. Retrieved from http://ro.uow.edu.au/ajpl/vol1/iss1/10

The Supplemental Instruction (SI) model is extended regarding its theoretical foundations by analyzing the recent transformations in higher education and evaluating the adequacy of SI's current foundations in light of these transformation. The author advocates inclusion of a multiliteracies perspective to recognize the growing diversity of the higher education student population. This is done through use of critical discourse analysis which is a blend of linguistic analysis and ideology critique. This is an important area for further investigation to keep SI relevant for the changes in higher education world-wide.

Craig-Claar, D. (1994). Starting Supplemental Instruction at Maple Woods Community College. *Supplemental Instruction Update*, 1-2.
The author is the Associate Dean of Instruction at Maple Woods Community College (MO). She describes the development of the Supplemental Instruction program at her campus. The article describes the administrative steps that were taken to initiate the program. A creative solution to compensate the SI leaders was that they were paid with fee waivers rather than the more common monthly paycheck.

Cross, I. G. (1997). *Peer support through Supplemental Instruction for civil engineering students.* Conference Proceedings of the 2nd Working Conference on Engineering Education: Professional Standards and Quality in Engineering Education, Sheffield, England.
This article describes the use of Supplemental Instruction for civil engineering students in the United Kingdom.

Dagneault, M. (2011). Supplemental Instruction in learning communities: A semester of trials, successes, and reflections *In the pockets of yesterday's pants: Theory, practice, theory* (pp. 33-39). Overland Park, KS: Johnson County Community College.Retrieved from http://216.185.229.27/files/pdf/writing-center/journal/writing-center-journal-no3.pdf#page=33.
Description of the experience of a SI Leader working with a learning community of several courses at a two-year institution.

Dalton, C. (2011). *The effects of Supplemental Instruction on pass rates, academic performance, retention and persistence in community college developmental reading courses.* (Ed. D. dissertation), University of Houston, Houston.
The purpose of this research was to measure the effects of the peer tutoring program Supplemental Instruction (SI) on pass rates, academic performance, retention, and persistence in community college developmental reading courses. Prior research indicated that SI improves final grades, attendance, retention, persistence, and graduation rates in college credit-bearing courses. However, the minimal research documented in the literature on the use of Supplemental Instruction in developmental education courses contained conflicting information. Archival data, collected from five semesters of comparative SI and non-SI developmental reading courses at an urban fringe community college, were analyzed to determine whether a significant statistical difference existed between the two groups. The pass rates, i.e. the number of A, B, and C grades, for the SI and non-SI groups were 75% and 70% respectively. However, a

chi-square analysis revealed there was not a statistically significant difference between the pass rates of the two groups (chi-square value .520). The academic performance measure, i.e. a statistical analysis of the SI and non-SI classes' scores on the developmental reading exit test/final exam, revealed that the mean scores were 82% and 81% respectively. An independent samples t-test confirmed there was not a statistically significant difference between these means ($t=.345$, $\alpha=.05$). The retention analysis, i.e. the number of students who attended classes through to the final exam, revealed that 80% of the students in the SI supported classes and 79% of the students in the non-SI supported classes were retained. A Difference in Proportions Test confirmed there was not a statistically significant difference in the retention rates between the two groups ($z = .1568$, $p = .5636$). The persistence analysis revealed that 74% of the students from the SI supported classes and 69% of the students in the non-SI classes registered for classes in the subsequent long semester. However, a Difference in Proportions Test revealed there was not a statistically significant difference between the persistence rates of the two groups ($z = .784$, $p = .7823$). The researcher concluded that the widely touted positive effects of Supplemental Instruction are diminished in community colleges with well-developed developmental education programs with courses currently exhibiting pass rates of 70% or higher. Therefore, the researcher recommends targeting the implementation of SI in developmental reading courses with traditionally high failure rates, e.g. courses created during the first week of the semester to accommodate late registering students. Also, community colleges without well-developed developmental education programs could implement Supplemental Instruction to accommodate for a lack of other support services and programs for developmental education students. In addition, the research revealed that the voluntary attendance aspect of traditional SI programs in developmental reading courses led to low attendance at SI sessions. Therefore, the researcher recommends course instructors assign mandatory graded assignments that require completion with the SI leader to boost attendance at SI sessions. Developmental reading programs could also create a mandatory lab attached to a course dedicated to SI peer led tutoring. Encouraging serendipitous observations warrant further investigation, including the effects of SI on the affective domain, the SI leader, and the course instructor.

Dalton, C., & Saxon, D. P. (2013). The effects of Supplemental Instruciton on developmental reading, part II. *Research in Developmental Education, 25*(2), 1-6.
This article reports the results, discussion, and conclusions of the study of Supplemental Instruction (SI) with developmental reading courses. The pass rate for the SI supported developmental reading courses was five percentage points higher than for non-SI supported courses. There was not a statistically significant difference between the pass rates of the SI and non-SI groups. There also was no statistically significant differences between the two groups regarding final course grades. Voluntary attendance practices with the traditional use of SI are not effective with less motivated students enrolled in developmental reading. It does not appear that SI is cost effective for use in developmental reading courses.

Dalton, C., & Saxon, D. P. (2013). The effects of Supplemental Instruction on developmental reading, part 1. *Research in Developmental Education, 25*(1), 1-6.

This article is part one of two part examining the effect of Supplemental Instruction (SI) with developmental reading. Part one provides an overview of SI and describes the study and methods employed in conducting the reseatrch concerning the use of SI with developmental reading.

Davies, E., & Vorster, J. (1994). *The SI leader as a teaching resource*. Paper presented at the South African Association for Academic Development Conference, University of Natal, Republic of South Africa.
In 1994 a Supplemental Instruction (SI) program was introduced in the Law Faculty at Rhodes University (South Africa). Two courses were initially selected for a pilot program: Legal Theory I and Commercial Law I with joint funding from the Academic Development Program and the Law School. Interviews with students suggested that the SI leader empowered the students to be more active in their own learning process and take additional responsibility for mastery of content mastery rather than being passive in the classroom. The SI activities were more student controlled while the formal tutorial program was viewed as more rigid and prescriptive.

Davies, J., & Johnston, S. (1994). The institutional implementation of Supplemental Instruction. In C. Rust & J. Wallace (Eds.), *Helping students to learn from each other: Supplemental Instruction, SEDA Paper 86* (pp. 55-63). Birmingham, England: Staff and Educational Development Association
This chapter describes the implementation of Supplemental Instruction at the University of Plymouth in the United Kingdom. Proponents of the SI program were careful to generate wide support rather than having the program implemented solely by the top institutional leaders. The "SI Working Group" was formed to carefully explore key questions before a final decision was made regarding SI implementation. Liaison relationships were established with the faculty staff, students, and the Dean. While there were challenges during the pilot implementation of SI, the program continues to develop.

Davis, E. E. (1999). *Student mentors: Experiences of being a Supplemental Instruction leader.* (Master of Science thesis), Indiana University.
The purpose of this Master Thesis was to examine the experience of serving as a Supplemental Instruction (SI) Leader upon the individual at Indiana University Purdue University Indianapolis (IUPUI). A qualitative research study was conducted of SI leaders during Fall 1997. Some common benefits cited were improved: communication skills, problem solving skills, subject matter knowledge, people skills, friendships, knowledge of campus layout and resources, time management skills, involvement and knowledge of campus activities, leadership skills, and feelings of connection to the campus. Some mentioned that SI opened doors to new experiences that drew them closer to their desired career goal.

Dawson, P., Lockyer, L., & Ferry, B. . (2007). *Supporting first year student supporters: An online mentoring model for Supplemental Instruction. .* Conference Proceedings of the Annual Pacific Rim First Year Conference, Australia. Retrieved from https://www.fyhe.com.au/past_papers/papers07/final_papers/pdfs/7e.pdf

Supplemental Instruction (SI), or Peer Assisted Study Sessions (PASS) as it is commonly known in Australia, involves experienced senior student Peer Leaders who provide regularly scheduled peer learning sessions with students enrolled in university courses. Commonly implemented on first year subjects, the sessions integrate "how to learn" with "what to learn", helping students achieve better grades and helping raise student retention rates. This paper discusses the challenges of supporting SI Leaders who are geographically dispersed across multiple campuses and considers the theoretical and empirical literature that informs the development of an online mentoring model.

Dawson, P., van der Meer, J., Skalicky, J., & Cowley, K. (2014). On the effectiveness of Supplemenetal Instruction: A systematic review of Supplemendtal Instruction and Peer-Assisted Study Sessions literature between 2011-2010. *Review of Educational Research, 20*(10), 1-31. doi:10.3102/0034654314540007.
Supplemental instruction (SI)—variously known as peer-assisted learning,peer-assisted study sessions, and other names—is a type of academic support intervention popular in higher education. In SI sessions, a senior student facilitates peer learning between undergraduates studying a high-risk course. This article presents a systematic review of the literature between 2001 and 2010 regarding the effectiveness of SI. Twenty-nine studies met the inclusion criteria. Due to methodological heterogeneity and lack of consistency defining the SI treatment, qualitative synthesis methods were applied. For seven included studies, however, an effect size of SI participation on final grades was calculated, ranging from d = 0.29 to d = 0.60. The findings of the review are consistent with claims validated by the U.S. Department of Education in the1990s that participation in SI is correlated with higher mean grades, lower failure and withdrawal rates, and higher retention and graduation rates. Specifically, those three claim statements were: 1. Students participating in SI within the targeted high-risk courses earn higher mean final course grades than students who do not participate in SI. This finding is still true when analyses control for ethnicity and prior academic achievement. 2. Despite ethnicity and prior academic achievement, students participating in SI within targeted high-risk courses succeed at a higher rate (withdraw at a lower rate and receive a lower percentage of [fail] final course grades) than those who do not participate in SI. 3. Students participating in SI persist at the institution (reenroll and graduate) at higher rates than students who do not participate in SI.

Dawson, P. J. (2010). *Examining how an online mentoring model may support new Supplemental Instruction leaders.* (Ph.D. dissertation), University of Wollongong, Wollongong, Australia. Retrieved from http://ro.uow.edu.au/theses/3208/
This study investigated online mentoring as a method of supporting inexperienced, geographically-dispersed Supplemental Instruction Leaders (SILs). Supplemental Instruction (SI) is an academic support program that employs successful senior students as SILs to facilitate regular peer learning sessions. Over 250,000 tertiary students attend SI each year worldwide (Arendale, 2002). Students who attend SI are more likely to succeed in their studies, achieve higher grades, and be retained at their institutions (Martin &Arendale, 1993). The Australian higher education sector has a need for initiatives like SI that support the success of non-traditional students (Bradley,

Noonan, Nugent, & Scales, 2008); however such programs can be difficult to implement in multi-campus institutions (Winchester & Sterk, 2006). In this study,online mentoring was examined as a method of addressing some of the difficulties in supporting inexperienced SILs who are geographically isolated. There is minimal research literature about the use of mentoring or community to support SILs, and none addressing the problem of supporting geographically dispersed SILs. Online mentoring and community models have been used successfully in other contexts to support novices that are geographically isolated from potential mentors and their peers. SILs are different from mentees in most mentoring literature; traditional mentees are either career employees or students being mentored for their academic success. In this study, SILs are being supported for a part-time, fixed-term role that few intend to continue as a career. The following research questions were investigated: Research Question 1: What models are appropriate for mentoring geographically-dispersed Supplemental Instruction Leaders? Research Question 2: In what ways does participation in an online SIL support program impact on mentors, mentees and community members? The study consisted of two phases, each addressing the corresponding research question. In Phase 1, an exploratory qualitative study was conducted into the development of an online mentoring model for geographically-dispersed SILs. A new theoretical framework was developed from Social Learning Theory (Bandura, 1977) and Social Exchange Theory (Emerson, 1976; Homans, 1958) to inform the design of the model. This framework assisted in understanding how mentoring happens, and why mentors and mentees might participate in it. In Phase 2 the model was investigated twice using a qualitative, multiple-case study methodology. There were 30 participants from six campuses of fiveAustralasian universities in the first study, and 67 participants from 27campuses of 25 academic institutions from three continents in the second study. Data were analyzed using a deductive approach based on the theoretical framework. Key findings of this research were: A model for the mentoring of geographically-dispersed SILs. An understanding of the impacts of the model on participating SILs. Role modeling was found to be the component of mentoring most used for SIL development; this is interesting given Ensher, Heun and Blanchard's (2003) proposition that "role modeling may be the function of mentoring that is least efficiently done in a virtual setting" (p. 273). A set of design variables for the development and expression of mentoring models. These variables address an identified need in the literature for clarity in academic communications about mentoring. A set of design variables for the development and expression of mentoring models. These variables address an identified need in the literature for clarity in academic communications about mentoring. This research has significance for online mentoring and higher education in general, and more specifically, the support of geographically-dispersed, part time staff, such as SILs and university tutors or teaching assistants.

Deaton, C. C., & Deaton, B. (2012). Using mentoring to foster professional development among undergraduate instructional leaders. *Journal of College Science Teaching, 42*(1), 58-62.
This study examines the mentoring relationships of student instructors who provide Supplemental Instruction (SI) for undergraduate science courses. Specifically, the researchers examined the relationships negotiated between mentor and protige student

instructors during the first year of the mentoring program. The undergraduate student instructors in this study are part of a Supplemental Instruction (SI) program that focuses on helping undergraduate students who are enrolled in science courses that are often labeled as traditionally hard courses. To support the new undergraduate student instructors in the SI program, a mentoring model was implemented to encourage collaborations with other undergraduate student instructors in the SI program. Findings of the study found that proteges developed session plans and different activities, found strategies to get students to participate more and be more active learners, proteges became more confident about their teaching abilities. The program also benefited the mentors by providing a professional experience in workign with another person, received intrinsic rewards such as feeling good in helping another, having someone follow their advice, improved their own teaching skill. The article also provides an overview of the mentoring program.

DeCarbo, B. (2008, 2008, October 2). Keeping up at college, *Wall Street Journal,* p. B 9.
This short newspaper article describes how Supplemental Instruction (SI) is being used at the University of North Carolina-Chapel Hill to improve academic success of students. Interviews from the program director and students attest to its usefulness.

Detchen, J. C., Hershberger, S. A. S., & Sarquis, J. L. (2004). *PLTL research explorations at Miami University.* Conference Proceedings of the 227th American Chemical Society National Meeting, Anaheim, CA. For more information, contact the authors at the Department of Chemistry and Biochemistry, Miami University, 501 E. High Street, Oxford, OH 45056, detchenc@muohio.edu
Peer-led Team Learning (PLTL) was used in a general chemistry course at Miami University (OH). PLTL was first used in 1998. A research study compared the impact of PLTL and Supplemental Instruction on different sections of the same course. All students in the different sections took the same ACS Examinations Institute exam as a final exam and each section was administered the Group Assessment of Logical Thinking instrument (GALT), and were surveyed using the Student Assessment of Learning Gains (SALG) instrument.

Diehl, N. D. (2012). *Using Supplemental Instruction to increase passing rates of developmental Algebra courses in community colleges.* (Masters of Science thesis), California State University, Channel Islands. Retrieved from http://hdl.handle.net/10139/5988
Developmental mathematics courses are historically difficult classes for community college students. The failure rate of these courses is alarmingly high. Supplemental Instruction (SI) was developed to assist students in mastering the concepts and as result increasing the passing rates of these difficult courses. SI is a program that uses small peer-assisted study sessions to improve the problem solving skills and the retention of students in historically high-risk courses. Study sessions are led by a student instructor that previously took the class and earned a good grade. This thesis is a study of the efficacy of Supplemental Instruction on Elementary and Intermediate Algebra courses at a community college. While our results do not specifically show

significant improvement in the passing rates, many students involved in Supplemental Instruction expressed a positive outlook on the program. SI is a way to reinforce topics presented in lecture without the students feeling the pressure of the instructor's presence. More study will need to be done to determine the efficacy of Supplemental Instruction in remedial math courses at community colleges. Supplemental Instruction, however, is recommended as another tool for students to use in high-risk courses, as our results show that SI students do as well as students in regular classes. Also, for many of them, the SI environment was very beneficial, as they had another source of instruction in a more relaxed atmosphere.

Donelan, M. (1994). Introducing Supplemental Instruction in mathematics, law, architecture, geography, and statistics. In C. Rust & J. Wallace (Eds.), *Helping students to learn from each other: Supplemental Instruction, SEDA Paper 86* (pp. 41-50). Birmingham, England: Staff and Educational Development Association
This chapter describes the introduction of Supplemental Instruction (SI) at University College London (UCL) in the United Kingdom. Goals for the SI program was to improve both students' personal skills alongside their academic abilities. SI was implemented to support cognitive skill development and provide them experience with group work. SI leaders are generally not paid as are other unpaid student facilitation programs elsewhere at UCL. SI was implemented in mathematics, law, architecture, geography, and statistics. Positive improvements were reported for both SI participants and the SI leaders.

Donelan, M. (1995). An enterprising start: Innovative teaching and learning at the University College London. *Universe: Innovation and Excellence at the University of Central Lancashire, 7*(1), 14-15.
This article describes a number of innovative learning practices being implemented at the University College London (the largest and oldest college in the federal University of London). Supplemental Instruction (SI) is one of the featured learning strategies at UCL. Paul Kohler, Sub-Dean in the Faculty of Laws cites benefits of the SI program that include: facilitates students' learning and understanding; prepares them for employment since they will have better skills for learning and applying new concepts.

Donelan, M. (1997). *Introducing Supplemental Instruction at University College London*. Unpublished manuscript. University College London. London, England.
This paper describes the introduction of Supplemental Instruction (SI) at University College London into the Department of Mathematics and subsequently into five other departments during 1993/4 at both undergraduate and postgraduate level. SI was seen to fit closely with the Enterprise in Higher Education program which aims to develop students' personal skills alongside their academic abilities.

Donelan, M. (1997). *Supplemental Instruction: Students helping students' learning at University College London and University of Central Lancaster*. Unpublished manuscript. University College London. London, England.
The Supplemental Instruction program aims to provide an untapped learning resource for academics interested in developing first year students' cognitive capabilities

alongside their personal skills. This study examines whether the pilot SI program meets the needs of first year students within the Law faculties of UCL and UCLAN. Whereas the US model places prime emphasis on increasing grades, the UK model develops more holistically to include both cognitive and affective aspects of learning, in which the benefits to the 2nd year SI Leaders becomes an important outcome as the outcomes for 1st year students.

Donelan, M. (1999). *SI leaders: The real winners.* Conference Proceedings of the First National Conference on Supplemental Instruction and Video-based Supplemental Instruction, Kansas City, MO.
While much has been written about the benefits of Supplemental Instruction (SI) to first-year students, significantly less has been written about the impact of this more holistic approach to learning and skills development as experienced by the SI leaders. Within the context of the major changes in higher education within the United Kingdom and the research into effective teaching and learning, this papers takes a qualitative view of the thoughts, perceptions, and feelings of undergraduate law students at University College London in 1997-98 as they developed from university entry to the end of their first year when they applied to become SI leaders for the following year. Common themes for SI participants included the following benefits of SI: valuable learning experience, consolidates knowledge through participation, cooperative and fun learning environment, social integration, and clarified difficult issues and improved understanding. Common themes for SI leaders: facilitate personal learning through discussions, received reciprocal support, improved communication skills, and improved understanding of the course material.

Donelan, M., & Kay, P. (1998). Supplemental Instruction: Students helping students' learning at University College London (UCL) and University of Central Lancashire (UCLAN). *The International Journal of Legal Education, 32*(3), 287-299.
The Supplemental Instruction (SI) program is used to meet the needs of first year students in their academic and personal development within the Law faculties of the University College London (UCL) and the University of Central Lancashire (UCLAN). The United Kingdom expansion of the SI model develops more holistically in cognitive and affective aspects of learning for both SI participants and SI leaders. The three law courses that had SI attached to them were English Legal System, Obligations 1, and Lawyers' Skills. There are several variations of SI within the UK use of the model: SI leaders are instructed to focus on facilitating the group discussion and not presenting course content material; SI leaders academic credit for their service through evaluation of a portfolio. Higher grades were recorded for SI participants and SI leaders when compared with non-participants. Interviews with SI participants revealed the following SI program benefits: enhanced academic understanding; enjoyed active learning; opportunity to clarify concepts; enjoyed the social aspects of meeting students of other classes; and developed personal confidence and reassurance. Benefits cited by the SI leaders included: opportunity to help others; developed communication, presentation, and leadership skills; increased knowledge of the academic content of the course.

Donelan, M., & Wallace, J. (1997). *Peer assisted learning: A truly co-operative initiative*. Unpublished manuscript. University College London. London, England.
This paper sets out to examine the place of peer assisted learning within the contest of higher education i the United Kingdom and to see how one model of co-operative peer learning, Supplemental Instruction, supports academic teaching, enhances the students' learning experience, reduces attrition, and most important of all in this context enables the students to develop confidence with the subject and practical development of those generic personal qualities and attributes most keenly sought by graduate employers: communication, teamwork, problem solving, negotiation, decision making, and management of self and others.

Doty, C. (2003). *Supplemental Instruction: National data summary, 1998-2003*. Unpublished manuscript. The University of Missouri-Kansas City, The International Center for Supplemental Instruction. Retrieved from http://www.umkc.edu/cad/si/sidocs/NationalSupplementalInstructionReport98-03.pdf
This report provides data supplied by 53 U.S. institutions between 1998 and 2003 concerning academic achievement for Supplemental Instruction (SI) participants and nonparticipants. The data is drawn from SI reports covering 745 courses with a total enrollment of 61,868 students. SI participants were defined as those who attended one or more sessions during the academic term. Outcomes displayed in the report included: SI participants received a D, F, or withdrew from the course at a rate between one-third and one-fourth that of non-participants, regardless of institutional type and mean final course grades were approximately half a letter grade higher for SI participants. These differences were statistically significant and were consistent across different types of institutions and academic content areas. The most prevalent use of SI is in the Natural Sciences (46%), followed by Social Sciences (20%), Mathematics (15%), and Humanities (7%).

Douma, S. R. (1988). *Supplemental Instruction: An alternate approach.* (Master's of Science thesis), Mankato State University, , Mankato, MN.
This Master of Science thesis study from 1986 had two purposes. The first was to provide a descriptive review of the Supplemental Instruction (SI) program (e.g., program overview, SI leader training program). The second purpose of the study was to evaluate the effects of SI at Southwest State University (MN) during Fall 1986, Winter 1987 and Spring 1987. Between 36 to 42 percent of students participated in the SI program. Findings include the following: 1) SI participants earned a higher final course grade. F86, 2.34 vs. 2.01, W87, 2.31 vs. 2.01, S87, 2.55 vs. 2.04. 2) SI participants earned a higher rate of A and B final course grades. F86, 42% vs. 31%, W87, 41% vs. 35%, S87, 54% vs. 36%. 3) SI participants earned a lower rate of D and F final course grades or withdrawals: F86, 21% vs. 33%, W87, 21% vs. 35%, S87, 19% vs. 35%. Several data tables from an article by Blanc, DeBuhr, and Martin (1983) are reproduced in this report. Individual course reports from Southwest State University that were used to generate the previous summary research studies are included: Natural Science, Biology I, Food for Thought, Everyday Chemicals, Accounting I, Introductory Algebra, Business Statistics I, General Psychology I, A.C. Circuits, Critical Thinking, and General Biology II.

Drake, R. G. (2011). Why should faculty be involved in Supplemental Instruction? *College Teaching, 59*(4), 135-141.
Because instructor-led Supplemental Instruction (SI) offers additional benefits in student learning and engagement over the more traditional peer-led model, in this article the author argues that faculty should consider participating in SI sessions. Benefits to participating in instructor-led SI include: students spend more time on task in faculty-led sessions, earn higher grades on exams, meaningfully interact with their professor (even in a large enrollment class), appreciate working collaboratively with their peers, and report gains in their academic self-confidence. As such, while still a relatively understudied intervention strategy, faculty-led SI warrants greater study and attention.

Drake, R. G., & Foresman, G. (2012). The impact of faculty and peer-led Supplemental Instruction: Comparing two disparate courses. *The International Journal for the Scholarship of Teaching and Learning, 7*(2). Retrieved from http://mountainrise.wcu.edu/index.php/MtnRise/article/view/203/140.
This 2009 study reports that faculty-led Supplemental Instruction (SI), a significant departure from the traditionally defined and implemented peer-led SI model, has a number of measurable advantages over the traditional peer-led model. The study was conducted at a doctoral-granting HBCU at North Carolina Agricultural and Technical State University. While it was observed that student grades on exams and in the course increased more for those who regularly attended faculty-led SI, students also reported that they preferred it to the peer-led sessions. The researchers postulate that faculty-led SI sessions are more likely to attract less academically-prepared students than the peer-led SI sessions. The faculty-led SI sessions also attracted more student participants than the peer-led SI sessions since in both cases, attendance was voluntary. The researchers also speculate that faculty-led SI sessions encouraged more emotional engagement in addition to intellectual engagement with the course material and therefore reinforced higher academic achievement and satisfaction. The two courses were analytical reasoning (based on typical topics of a logic course) and a contemporary world course that uses an interdisciplinary approach to study the social, economic, political, and cultural roots of modern society.

Dubetz, T. A., Barreto, J. C., Deiros, D., Kakareka, J., Brown, D. W., & Ewald, C. (2008). Multiple pedagogical reforms implemented in a university science class to address diverse learning styles. *Journal of College Science Teaching, 38*(2), 39-43.
This study investigates a group of students enrolled in a General Chemistry I sections between fall 2001 and fall 2002. The control sections were taught without full implementation of all reforms. The sample group of students were enrolled in the same class between spring 2003 and spring 2004. The entire set of nine pedagogical reforms were used. Supplemental Instruction (SI) was one of those nine reforms implemented. Final course grades increased and rates of course withdrawal decreased at a statistically-significant rate. Student comments also confirmed these results with higher student satisfaction.

Duckett, J. (1996, 1996, April 28). Tutors offers more than last-minute fix, *The Morning Call Newspaper,* p. E1.
This newspaper article describes tutoring programs at colleges in the Allentown, PA area. Supplemental Instruction (SI) is used at Kutztown University.

Dyett, J. M. (2010). *Determining physical therapy students' perceptions about faculty-led Supplemental Instruction at a selected community college.* (Ph.D. dissertation), Capella University, Minneapolis, MN.
The purpose of this research study was to examine the perceptions of students in faculty-led supplemental instructional (SI) sessions. A qualitative research design enabled the researcher to focus on insight and discovery based on the lived experiences and perceptions of the participants. The participants were 20 physical therapy students enrolled in the nursing and allied health department of an urban, east-coast community college between August 2009 and May 2010. Data were acquired from the transcriptions of personal interviews with 20 heterogeneous, multicultural students ranging from 22 to 53 years of age. Students shared that having a faculty member available in the tutorial and practice/open lab environment helped to build their confidence levels and to understand the need for repetition. Participants also noted that work schedules and children were barriers preventing them from consistently attending faculty-led SI sessions. Recommendations for participant support included encouraging students via synchronous and asynchronous motivation, more flexible SI schedules, and stipulations for implementing mandatory attendance to SI sessions. An additional recommendation was to establish structured guidelines for first year students. Further research is needed to develop a full understanding of the findings, relative to the statistical data of grade point averages, varied attendance practices, and the participants' perception of the faculty-led environment. Additional research is needed to understand the lived experiences of the participants who have families and/or employment obligations hindering their ability to consistently attend the scheduled faculty-led SI sessions. Further research is also needed to gather a comparative analysis between regional institutions.

Eastmond, J. N. (1997). Five academic development programs in the Eastern Cape Province: Reactions of an American academic in South Africa. *Educational Technology Research & Development, 45*(3), 129-134.
This article describes the academic development programs at four tertiary institutions in South Africa (University of Port Elizabeth, Port Elizabeth Technikon, Rhodes University, and the University of Ft. Hare) as well as the development of a fifth new program at Border Technikon. Topics include cross-cultural differences; interviews; Supplemental Instruction (SI) that combined staff development and student academic development; integration of media support; and stages of program development. The author describes how a former SI student leader at the University of Port Elizabeth had been hired as an instructor at Border Technikon. Based on interviews, the previous experience as SI leader had a direct impact upon the new instructor's style of instructional delivery which utilized a high degree of academic inquiry and guided classroom discussion. The author commented about how the SI program was able to combine both staff development and student academic development. While this was a

common pattern with South African institutions, the author commented that this was largely unknown in the U.S. The author subscribed to a four-stage model for faculty development previously articulated by DeBloois and Alder, 1974: 1). Awareness: through guest speakers, newsletters, and similar low impact activities; 2). Faculty support: small grants to faculty, seminars or workshops on aspects of tertiary teaching; 3). Faculty skills: larger investment in course development, more extensive involvement of individual faculty; and 4). Departmental curriculum: extensive development of a series of courses in the curriculum, organizational development efforts to change the prevailing reward structure.

Eastmond, J. N., Bartlett, G., & Terblanche, N. (1997). Planning for student involvement in a program of Supplemental Instruction. *Educational Technology Research and Development, 45*(3), 134-140.
Supplemental Instruction (SI) is used at Border Technikon (South Africa) to increase student achievement in the Accounting and Management academic departments. The article describes the ways student involvement has been maintained through enlisting support from the Student Representative Council (SRC). Article topics include: training, funding considerations, effectiveness, student response, and student achievement results. A grant provided through the United States Agency for International Development (USAID) Tertiary Education Linkages Project (TELP) was used to start the SI program. The grant's major goals are to enhance staff and student development, both of which were enhanced through the SI program. SI leaders reported the following benefits to them from participation in the SI program: gained confidence in public speaking; developed new teaching strategies; and enjoyed more interaction with the course lecturers. Surveys of SI participants identified the following suggestions to improve the SI program: assign the same place each week for SI sessions; SI leaders should prepare before SI sessions to provide structure in case the attending students do not have a full agenda of items; SI leaders should receive additional interpersonal discussion group skill training; and that times should be set aside in class scheduling to allow for SI sessions to be scheduled. Analysis of final course examinations revealed that the number and percent of students who passed the final examination had doubled after the introduction of the SI program. The author found stated that this was remarkable considering that the class size had increased significantly, straining the ability of the course instructor to deal with the additional workload of students.

Eberling, D. J. (1998). *A comparison of the effectiveness of study strategies instruction with community college students.* (Ph.D. dissertation), University of Houston, Houston, TX.
College students who use study strategies effectively are more successful in school than are those who are unaware of study strategies, or who use such strategies infrequently. There is a relationship between poor performance in school and inadequate study strategies. Fortunately, study strategies can be taught. The purpose of this dissertation study was to investigate the relation between grade point average and study habits and attitudes. Also, to examine the effectiveness of a study strategies course and the Supplemental Instruction (SI) program with community college students '

study habits and attitudes. Volunteers for the study completed a pre and post test of the Survey of Study Habits and Attitudes (SSHA). Small sample size (n=10) may have played a role in clouding results of the research. Most students refused to participate in the study by permitting access to course grades and other vital information variables. With this SI program, attendance in SI sessions was not tracked and therefore the quantity of SI attendance was not available as an independent variable which has been used with many other published studies. With the small remaining group of voluntary study participants, a comparison of the students' grade point average and scores on the SSHA did not reveal significance. The scores on the SSHA and the comparison between the study strategies course and the SI program revealed no significant difference between the treatment groups.

Eckard, S., & Hegeman, J. (2002). *Breaking the rules: Mandatory SI for developmental readers.* Conference Proceedings of the National Association for Developmental Education, Orlando, FL.
This article describes the use of Supplemental Instruction (SI) for developmental readers at Frostburg State University (MD). The students enrolled for a block of three courses: Reading, a choice from several general education course that are reading-intensive (history, psychology, or sociology), and a section of Freshmen Orientation that emphasized the development of study strategies. These students participated in a mandatory SI laboratory session each week to develop successful reading and study skills. Final course grades favored the SI participants in the history and sociology courses, but not in psychology.

Edelnant, V. (1999). Supplemental Instruction program helps students succeed. *Recruitment and Retention in Higher Education, 13*(5), 3.
This short article describes the use of Supplemental Instruction (SI) at Wartburg College in Waverly, IA. The SI program is four years old at the 1,500 student undergraduate Wartburg College. Benefits for the SI leaders reported by the author include developing empathy for the faculty members, experimenting with a possible career as a teacher, and development of their leadership skills.

Edelson, M. (1996). *A student's experience of the Supplemental Instruction programme and the first year of university: A case study.* (Ph.D. dissertation), University of Port Elizabeth, Port Elizabeth, Republic of South Africa.

Ehly, S. W., & Topping, K. (1998). Summary and conclusions. In K. Topping & S. Ehly (Eds.), *Peer-assisted learning* (pp. 313-327). London: Lawrence Erlbaum Associates, Publishers
This book chapter discusses the potential future impact of peer-assisted learning (PAL) programs in the United Kingdom higher education system. PAL is based upon Supplemental Instruction.

Eig, J. (1997). Supplemental Instruction programs: An effective way to increase student academic success? *Journal of The Indiana University Student Personnel Association*, 11-15.

Supplemental Instruction (SI) is used at Indiana University (Bloomington) to increase academic achievement and retention. This article provides a basic overview of the SI program and data concerning its effectiveness at the institution. Challenges for implementing SI include: administratively SI programs require considerable coordination; SI leaders must be carefully selected for their academic and interpersonal skills; SI leaders must be trained prior to the academic term and receive supervision throughout the term; students must make a time commitment to attend SI sessions; and the institution must have sufficient professional staff to supervise the SI program.

Eisenhauer, L. (2002). *Closing the gap: Can attendance to Supplemental Instruction classes remove the academic gap between target and non-target students?* (Ph.D. dissertation), Cornell University, Ithaca, NY.

Emal, C., Johnson, T., & Kelter, P. B. (1997). *Supplemental Instruction: A model program that goes against the grain*. Unpublished manuscript. University of Nebraska at Lincoln. Lincoln, Nebraska.
This report examines the use of Supplemental Instruction (SI) at the University of Nebraska (Lincoln, NE). After an initial overview of the SI model, the paper reports on a study of the use of SI in multiple sections of Chemistry 109 (1,100 to 1,300 students total) over a period of five academic terms (Fall 1994 through Fall 1996). The SI participants earned a mean final course grade of 2.70 vs. 2.12 for the nonparticipants. The SI participants received a much lower rate of D, F and withdrawal grades (17.2 percent) when compared with the nonparticipants (42.9 percent). There was a positive correlation between increased attendance at SI sessions with higher mean final course grades. A further analysis of students was accomplished by dividing them into quartile groups on the basis of their standardized college entrance scores (ACT). Whether it was the top (3.18 vs. 2.53), bottom (1.97 vs. 1.68) or middle quartile groups (2.60 vs. 2.04) the SI participants received approximately a mean final course grade that was half a letter grade higher It appears that SI was equally attractive to all students since approximately the same percent of students attended SI from each of the quartile groups (18 to 20 percent).

English, B. J. (1999). *Effects of social integration on the academic performance of international students*. Unpublished manuscript. The University of Southern California. Los Angeles, CA.
This manuscript describes the use of Supplemental Instruction (SI) with postsecondary international students. A comparison is made between SI and the English Language Fellows Program at the University of Rhode Island which has similar purposes. The focus of the sessions is placed more on the use of language as the means for communicating and understanding the course material. The pairing of the native and nonnative speakers of English provides a rich atmosphere for language acquisition and fostering higher comprehension of the course content. The author then explores adapted use of Video-based Supplemental Instruction (VSI) for nonnative speakers as a supplement to challenging courses to aid in language development and mastery.

Etter, E. R., Burmeister, S. L., & Elder, R. J. (2000). Improving student performance and retention via Supplemental Instruction. *Journal of Accounting Education, 18*, 355-368.
This study reports on student performance, and failure and withdrawal rates for 9,053 students enrolled in 132 Principles of Accounting classes from 21 four-year colleges and universities that have adopted the Supplemental Instruction (SI) program. The overall SI participation rate was 26.8 percent. After providing an overview of the SI model, the data study concerning accounting occupies the rest of the paper. SI participants were found to have statistically significant higher average course grades (2.44 vs. 2.12), lower failure rates (5.9% vs. 15.3%) and lower withdrawal rates (10.6% vs. 19.8%) than non-participants enrolled in the target courses.

Evenbeck, S., & Williams, G. (1998). Learning communities: An instructional team approach. *Metropolitan Universities: An international Forum, 9*(1), 35-46.
At the Indiana University-Purdue University Indianapolis (IUPUI) a commitment was made to widely implement learning communities throughout the curriculum. This chapter provides a narrative overview of the implementation of this approach throughout the campus. The freshmen seminar is taught by a team that includes faculty, an academic advisor, librarian, and a Supplemental Instruction (SI) leader. This team approach provided for a rich learning environment for first-year students. Freshmen students were enrolled in a similar cohort of classes which provided high interaction among them and the team that taught the freshmen seminar. The SI leaders facilitated study review sessions for one of the common courses that all students in the cohort had enrolled for that academic term.

Fallon, D. M. (2005). *An analysis of academic assistance programs on at-risk students at the United States Naval Academy.* (Master's of Science thesis), Naval Postgraduate School, Monterey, CA. Retrieved from http://stinet.dtic.mil/cgi-bin/GetTRDoc?AD=ADA435690&Location=U2&doc=GetTRDoc.pdf
The purpose of this research is to examine the impact of academic assistance programs on at-risk students at the United States Naval Academy. Each year, students determined to be at-risk are enrolled in an academic assistance program known as the Plebe Intervention Program. In addition, other academic assistance programs are available to these students. In particular, the Naval Academy administers a program known as the Midshipmen Group Study Program, which is based on the Supplemental Instruction model. This study examines the impact of participation in each of these programs as a determinant to persistence beyond the freshman year. Other determinants examined included demographics (ethnicity and gender), course grades, athletic status, and preadmittance data (SAT scores).

Faqrrell, H., Pastore, C., Handa, N., Dearlove, J., & Spalding, E. . (2004). *Initiating the new battlers.* Unpublished manuscript. Retrieved from http://www.proceedings.com.au/isana/docs/2004/paper_handa2.pdf
The cognitive benefits of peer mentoring for all students, and in particular for international students are closely linked to the socio-cultural context in which the learning takes place. As a supportive program, it is especially beneficial for international students who have opportunities to develop and practice additional skills such as group

participation, negotiation and leadership qualities. This supportive context in turn, encourages appropriate socio-cultural, affective adjustments to the university. The experience of mentoring and of being mentored develops a sense of collegiality among students who consequently feel more positive about their learning. They also feel a sense of ‘connection’ to the university community. For the program to run successfully there is a need for cooperation between academic and training staff as well as cooperation between groups of students. This cooperative and collaborative ethos of the program positively affects the climate of the overall university (Shores & Tiernan, 1996

Farmer, B. (1991). Helping learners to help themselves. *Teaching and Learning Bulletin*(7), 2-3.
This article describes the use of Supplemental Instruction (SI) at several institutions in England. The author, a member of the Learning Methods Unit at Birmingham Polytechnic, describes research that was shared at a SI workshop coordinated by Kingston Polytechnic and the World Wild Life Fund for Nature.

Fayowski, V. (2006). *An evaluation of the Supplemental Instruction program implemented in a first-year calculus course.* (Master's of Science thesis), University of Northern British Columbia, Prince George, British Columbia, Canada.
Supplemental Instruction (SI) is a voluntary program that incorporates collaborative learning in peer-led, small group settings in order to integrate instruction in learning and reasoning skills with the content of the course with which the SI is paired. Calculus for Non-Majors is the course that forms the basis of this three year study. This study addresses two related questions. First, does SI participation improve student achievement, as measured by course final letter grades? Second, does SI participation improve the pass/fail rate in the course? Prior student success, a combination of ability and motivation, was statistically controlled for in both analyses through the use of incoming grade point average. Gender was also chosen as an independent variable both for increased statistical sensitivity and generalizability. The effect of SI participation in Analysis of Covariance, after prior GPA and gender were controlled for, was statistically significant ($p < .0005$) and practically significant ($d = .48$) or the equivalent of a two letter grade improvement. Pass/fall analysis was determined through binary logistic regression with observed statistically significant differences between the first model containing both prior GPA and gender and the second (full) model which also contained SI (chi-square = 41.19, $p < .0005$). In the full model gender did not contribute significantly ($p = .24$). The odds of succeeding were 2.7 times greater for SI participants. Overall, SI participants succeeded at a higher rate than non-participants (73% vs. 51%). These findings are consistent for both genders. Supplemental Instruction is an effective method for boosting success rates in a difficult undergraduate course with concentrated mathematical content.

Fayowski, V., & MacMillan, P. D. (2008). An evaluation of the Supplemental Instruction programme in a first year calculus course. *International Journal of Mathematical Education in Science and Technology, 39*(7), 843-855.

The Supplemental Instruction (SI) approach was used in a first year calculus for non-majors course at the University of Northern British Columbia in Canada. An ANCOVA indicated that ability/motivation, as measured by prior grade point average, was a useful predictor of course letter grade; and SI participation was statistically significant. The odds of success were 2.7 times greater for SI participants than nonparticipants.

Feinn, R. (2004). Effectiveness of Supplemental Instruction for developmental math in a university setting. *Dissertation Abstracts International, 65*(02), 410.
This dissertation explored the utility of Supplemental Instruction (SI) at a public university in New England with an elementary algebra course. The study sample consisted of all students enrolled in MATH099 during the fall of 2001, when SI was used, and all students enrolled in the same course during the fall of 2002, when instructors led the study sessions. Combined the sample was nearly 1,700 students, with no statistical difference in gender, race, or placement test scores between years. Using multilevel modeling to capture the within class covariance, it was found that students who had study sessions led by instructors had higher final exam scores and better course letter grades then students who experienced typical SI. However, the withdrawal rates were similar between students who experienced instructor led tabs with students who had peer-assisted lab sessions. Having instructors lead supplemental lab sessions is more effective than traditional SI, where a peer leads the study session. In addition, the cost for having instructors lead the sessions is less than half the cost for implementing SI.

Fest, B., Beauchamp, L., Holladay, J., & Sparks, S. (1999). *The use of graduate students/experienced Supplemental Instruction (SI) leaders as SI supervisors*. Unpublished manuscript. The University of Texas at Austin. Austin, TX.
This manuscript describes the use of graduate students and experienced Supplemental Instruction (SI) leaders to serve as SI supervisors with the SI program at the University of Texas at Austin. An established SI program has a natural set of experienced SI leaders who can assume additional responsibilities within the program, thereby allowing the program to expand with the appropriate level of supervision. Extensive information is presented on how the SI program is supervised by both the professional as well as student paraprofessional staff.

Fest, B. J. R. (2000). The effects of Supplemental Instruction (SI) on student performance in a college-level biology course [Dissertation, The University of Texas at Austin, 1999]. *Dissertation Abstracts International, 80*(09), 3311.
This experimental study examined the effects of participation in a Supplemental Instruction (SI) program on student performance in a college level biology course. SI is an academic support program which incorporates study techniques into the framework of an academic course through discussion sessions. According to Blanc, DeBuhr, and Martin (1983) and Kenney (1988), students who experienced Supplemental Instruction had higher course grades, semester grade point averages, and rates of re-enrollment than did non-participants. The present study was conducted within the scheduled discussion sections of a large lecture class of biology for science majors (n = 135). The researcher and another graduate student conducted these discussion sessions in which

half of the sections served as the SI treatment group and half of the sections served as the non-SI (traditional) control group. This design eliminated both time on task and motivation as potential contaminating variables. This posttest only, quasi-experimental design study uses a modified nonequivalent control group design. The academic performance of students who participated in SI discussion sessions was compared to the academic performance of students who participated in traditional review-type discussion sessions. Other research questions examined the interactive effect of SI on student performance with respect to SI leader experience, student ability level as measured by total SAT scores, previous academic success as measured by previous college GPA, and different cognitive level of examination questions. t-test and ANOVA statistical methods were used to analyze the data. The results of the t-tests to compare the means of the SI group to the non-SI group (p < .458) do not indicate any significant difference in the semester course scores between the two groups. Thus, the data did not show an overall effect of SI on student performance. The most important results obtained from this study are those with respect to the interactive effect of SI and student ability groups as measured by SAT total scores and prior college GPA. In this study the students in middle ability groups seemed to benefit more from SI than did the lower and higher ability students.

Finney, J. E., & Stoel, C. F. (2010). Fostering student success: An interview with julie Phelps, Virginia B. Smith Innovative Leadership Award Recipient for 2010. *Change, 42*(4), 38-43.
The article profiles an innovative leader with student success at Valencia Community College. Among the programs Ms. Phelps cites as contributing to student success is Supplemental Instruction. An overview of how SI operates at the college is provided.

Fisher, J. E. (1997). Effects of Supplemental Instruction on undergraduate academic achievement, motivational orientation, and learning strategies [Dissertation, Auburn University, 1997]. *Dissertation Abstracts International, 58*(10), 3831A.
Examined in this dissertation study were the effects of participation in a Supplemental Instruction (SI) program on student academic achievement, motivational orientation, and learning strategies in a core psychology course at Auburn University. Participants in this study were 381 undergraduate students divided into one treatment and two comparison groups. Students in the treatment group participated in SI outside of regular class time once a week for 9 weeks. Both the treatment and comparison groups were administered four items: a course content knowledge pretest, the Halpin and Halpin Demographic Survey (1996), the Motivated Strategies for Learning Questionnaire (1994), and a course content knowledge posttest. Both the pretest and posttest were teacher-made tests assessing knowledge of course content. An initial cross-tabulation frequency distribution followed by a chi-square supported the assumption that the two groups were equal on course entry demographic variables. An analysis of variance (ANOVA) conducted with pretest scores revealed that there were no significant differences across groups in pre-entry content knowledge prior to the treatment. Once the study was completed, a multivariate analysis of variance (MANOVA) was conducted revealing that there were differences between the groups. On two variables, peer learning and help seeking, significant differences were found in

favor of the SI treatment group. The groups did not differ on the other motivation and learning strategies subscales or on the posttest measuring academic achievement. Several research design features were unusual with this study. Most SI studies limit possible variables that might influence student achievement. Therefore, most research designs limit analysis to a single course, one course instructor, one SI leader, analysis of actual course grades, and provide no additional academic enrichment activities in the class. Numerous limitations were listed by the researcher in the dissertation. 1) The actual final course grades of the students were not used, but rather a teacher-made posttest that was one part of the final course grade. 2) To increase sample size, additional sections of the same course were added to the study even through SI was not available to them and the course sections were taught by other professors who may employ different approaches to the curriculum, grading, and instructional delivery. 3) Ten SI leaders were employed in one course section. 4) All students in the course also participated in mandatory discussion sessions conducted each week. Fifteen graduate teaching assistants conducted these sessions in the three course sections. 5) All students who scored high on the course pretest were given an "A" final course grade and were dismissed from the course. This excluded their potential involvement in SI sessions and providing additional successful student modeling other than the SI leader. 6) Students were not allowed to attend SI sessions more than once a week. Students who needed additional help were denied the assistance. 7) Since the pre/post test was teacher-made, there is no way to judge its validity as an instrument. 8) The final exam was optional for students. If students already had an "A" average, they could skip the exam, therefore they were then excluded from the study. Students who needed a few points to earn a "B" only needed to correctly answer enough questions on the posttest exam to earn a "B" final grade, even though they might have earned a "D" or "F" on the final exam.

Fisher, M. (1988, 1988, September 23). UD "ringers" succeeding academically, *Dayton Daily News,* p. 3.
This newspaper article describes the use of Supplemental Instruction (SI) at the University of Dayton (OH)

Fitzgerald, N. (1997). The dropout dilemma. *Careers and Colleges Magazine, 18*(2), 14-17, 26.
This article reviews the causes and cures for the high rate of college drop outs. The author interviewed a number of people for the article. One of those interviewed and quoted in the article is David Arendale, National Project Director for Supplemental Instruction (SI). Arendale describes how SI and its newest variation, Video-based Supplemental Instruction help students to integrate "what to learn" with "how to learn it"

Fjortoft, N., Bentley, R., Crawford, D., & Russell, J. C. (1993). Evaluation of a Supplemental Instruction program at a college of pharmacy. *American Journal of Pharmaceutical Education, 57*(3), 247-251.
The purpose of this study was to evaluate, in terms of improved final grades, the effectiveness of the Supplemental Instruction program with students enrolled in a required first year pharmacy course at the University of Illinois at Chicago College of

Pharmacy. Regular SI attendance was found to be significantly and positively related to final course grades for minority students. The authors postulate that the SI program might have been more effective if the SI program had been started the first week of class rather than being delayed until the third week. An additional factor that may have diminished the statistical impact of the SI program was that funds were not available to hire additional SI leaders since the average SI attendance at every session through the academic term was 52. The authors speculate that smaller groups might have been more helpful than these large groups since students could have been more active and be able to vocally participate with others.

Forester, J. P., Thomas, P. P., & McWhorter, D. L. (2004). Effects of four Supplemental programs on students' learning of gross anatomy. *Clinical Anatomy, 17*(4), 322-327.
This article evaluated the effectiveness of Supplemental Instruction (SI) when adapted for use through four interventions: second-year medical student teaching assistant program, directed study program, weekly instructor laboratory reviews, and a web-based anatomy program. In each case participants in the adapted SI programs earned higher grades and self-reported higher levels of satisfaction when compared with nonparticipants.

Forson, L. (2000). *Supplemental Instruction: Can it work in outcomes-based education?* Vista University, Republic of South Africa. Available from the author at Vista University, Welkom Campus, PO Box 1881, Welkom 9460, FRSON-LF@weasel.vista.ac.za
The paper compares the basic tenets of Supplemental Instruction and Outcomes-based Education. Using the SI program at the Welkom campus of Vista University in the Republic of South Africa has been used for both raising student academic achievement as well as fulfilling outcomes-based institutional objectives. SI sessions can be intentionally designed to carefully augment and support instruction in the traditional classroom. The SI leader can ensure that students engage in meaningful work during SI sessions that relate to institutional mission.

Frans, P. (1997). *The development of Supplemental Instruction facilitators as skilled and confident leaders*. Unpublished manuscript. South African Association for Academic Development Conference. Broederstroom, Republic of South Africa.
This paper describes the use of Supplemental Instruction (SI) at Vista University-Mamelodi Campus (South Africa). In addition to fulfilling traditional SI program objectives, additional ones were a focus of this contextualization: providing feedback to the lecturer concerning student comprehension, thereby providing an opportunity to revise content delivery; give opportunity for students to use their first language rather than having all conversation occur in English; providing another venue for faculty development; and ensuring that all stakeholders -- students, course lecturer, SI Supervisor, and SI leaders -- work together to evaluate the SI program.

Frans, P. (1998). *Evaluation of the Supplemental Instruction (SI) programme implemented at a historically disadvantaged university.* Conference Proceedings of the South African Association for Academic Development Conference, Bloemfontein, Republic of South Africa.

Frericks, K. (2006). *The relationship between Supplemental Instruction, coure grade, and retention of freshman students.* (Master's of Science thesis), Minnesota State University Moorhead, Moorhead, MN.

Gaddis, B. A. (1994). The science learning center. *Education, 115*(2), 195-201.
This article describes the services provided by the Science Learning Center at the University of Colorado in Colorado Springs. The Center had three primary objectives: (1) to identify the mathematical, computational, and conceptual skills needed by science students; (2) to assist students to master basic conceptual, mathematical, and computational skills that are common to most science disciplines; and (3) to develop skills in the use of basic and specific laboratory instrumentation required in most science disciplines. To help meet the second goal, Supplemental Instruction (SI) was offered in connection with historically-difficult science courses (e.g., physics or organic chemistry). Research studies suggested that SI participants received higher mean final course grades. Since the Center's creation in 1992: the number of students enrolled in basic science classes increased by 12 percent; the number of declared science majors increased by 37 percent; 72.1 percent of students who used services from the Center received a grade of B- or better; cum GPA of students who used the Center's services had an average of 3.03 vs. 2.49 for those who did not; the rate of attrition of science classes dramatically dropped (e.g., Chemistry I, the rate decreased from 39.7 percent to 5.7 percent; Physics III, 16.5 percent decreased to 4.8 percent; Biology I, 16.7 percent decreased to 3.2 percent. SI was one component of a comprehensive Center that contributed to these positive outcomes.

Garcia, E. (2006). *Supplemental Instruction, study habits, and the community college student.* (Master's of Science thesis), Florida International University, Miami, FL.
The purpose of this study was to demonstrate if the academic assistance program Supplemental Instruction (SI) facilitates the acquisition of effective study behaviors through strategies that transcend simple double-exposure to the course material. Its advocates claim it increases academic achievement using learner-centered knowledge and acquisition of effective study behaviors. SI sessions are specifically related to particular courses that students are taking. Sessions are facilitated by the SI leader who has taken the subject matter course in the past. Students review the content of the previous subject matter class using collaborative learning strategies coordinated by a SI leader. In addition, the SI leader models appropriate study behaviors in his or her interactions with the students. An instructor at a large Florida community college who taught five classes of an Anatomy & Physiology I course (traditionally supported by SI) was identified. Two of the classes were randomly selected to participate in SI activities, and two classes were random chosen to participate in alternate, computer-based activities that dealt with the course content, but did not include work in developing students' study behaviors. These treatments were carried out over the course of an entire semester. Participation was mandatory. Data were collected on two variables. Academic achievement in anatomy and physiology content was measured both pre- and post-treatment using an instructor developed examination. Student study behaviors were measured using pre- and post-treatment administration of the *Study Behavior*

Inventory, a valid and reliable instrument that provides scores on three categories of study behaviors: (a) Academic self-efficacy, (b) Preparation for routine academic tasks, and (c) Preparation for long range academic tasks. Measures obtained at the end of the semester of treatment revealed no significant differences between the SI and alternative treatment groups in post-treatment achievement test score and the post-treatment scores on the three study behaviors categories when adjusted for pre-treatment scores. These results suggest that the development of appropriate study behaviors requires more time than SI, as it is now implemented, can provide. In addition, results indicate that improved academic achievement may be attained through any number of means that include repeated exposure to course material.

Gardiner, P., Corbett, B., & Palmer, P. (1994). Increasing student participation in the education of civil engineers. In J. Wallace (Ed.), *Kingston University HEFCE Supplemental Instruction Project: 1993-94* (pp. 237-241). London, England: Kingston University
Through use of Supplemental Instruction in the civil engineering courses at the University of Brighton (East Sussex, United Kingdom), improvement occurred in: student learning, self-motivation, and team work skills.

Gardiner, R. (1996). *Supplemental Instruction: A cost-effective, student-centered collaborative learning program.* Conference Proceedings of the Second International Open Learning Conference, Brisbane, Queensland, Australia.
This paper presented by Emeritus Professor Ron Gardiner of Queensland University of Technology describes the use of Supplemental Instruction (SI) in Australia. After an extensive description of the SI model, program benefits for the SI Leaders and the course instructors are described. Benefits to the SI Leaders include: deeper understanding of the course content; development of leadership and group facilitation skills; increased self-confidence; improved job marketability and admission to advanced graduate work due to service as SI Leader; development of professional relationship with course professor; membership in an effective peer support network; and modest financial reward. Benefits for the course professors that have SI attached to their lectures: timely feedback concerning the comprehension level of the students regarding course material; opportunity to repeat previous lecture material in a modified fashion to increase comprehension; an option to modify future teaching strategies based on feedback from students; a basis for accessing additional funds through grants (e.g., teaching and learning development grants); increased rapport with students and SI Leaders; membership in local, national and international SI network; increased recognition from their colleagues; and increased satisfaction with their teaching role. The institution benefits in several ways: deployment of a cost-effective, student-centered learning enhancement program; membership in national and international SI networks; and effective means of managing the collective learning power of its students.

Gardiner, R. (1997). *Comparison of costs and financial benefits of a Supplemental Instruction program*. Unpublished manuscript. Queensland University of Technology, . Brisbane, Queensland, Australia. Available from the author: Emeritus Professor R B Gardiner, Ph.D., SI/PASS Program Coordinator, Queensland University of Technology,

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This paper describes the benefits of the Supplemental Instruction (SI) program in terms of educational outcomes and financial benefits. The costs and benefits are based on implementation at higher educational institutions in Australia. Based on higher reenrollment rates of SI participants, the SI program increases revenue through savings from lost student fees and tuition. Preliminary data from Queensland University of Technology in Civil Engineering suggest an increase in 15 percentage points for reenrollment of SI participants. However, the financial equation model described in this paper is very conservative and only estimates a difference of 5 percentage points.

Gardner, J. F., Moll, A. J., & Pyke, P. A. (2005). *Active learning in mathematics: Using the Supplemental Instruction model to improve student success.* Conference Proceedings of the 2005 American Society for Engineering Education Annual Conference & Exposition, Portland, Oregon.
Boise State University (Boise, ID) adapted the Supplemental Instruction (SI) program for use in mathematics called Active Learning in Mathematics (ALM). ALM was used to support courses in pre-calculus and Calculus II that serve as foundations for engineering programs. After starting as a program similar to the traditional SI model, ALM has added some new features: interact with students via Internet discussion rooms in addition to face-to-face group sessions; extensive training throughout the academic term; and interactions between ALM session facilitators and students via e-mails and phone calls. The results have been positive. While the academic preparation level of the entering students are lower than average, the academic achievement of the students is among the highest in the U.S. for engineering programs.

Garland, M. (Writer). (1992). Supplemental Instruction: Interview with Deanna Martin and Robert Blanc [Videotape]. In J. Connett (Producer). Kansas City, MO: National Diffusion Network, United States Department of Education.Available: Center for Supplemental Instruction, University of Missouri-Kansas City, 5014 Rockhill Road, SASS #210, Kansas City, MO 64110
This videotape interview provides a historic overview of the Supplemental Instruction (SI) program. The creator of the SI program -- Deanna Martin -- and her husband Robert Blanc who customized the use of SI with medical students are interviewed in this program. Topics included: overview of the SI program; historical background of SI; typical activities in SI sessions; training of SI leaders; and suggested methods of evaluating the SI program.

Garland, M., & Anderson, J. (Writers). (1985). Supplemental Instruction: The review session [Videotape]. In M. Garland (Producer). Kansas City, MO: Center for Supplemental Instruction, The University of Missouri-Kansas City.Available: Center for Supplemental Instruction, University of Missouri-Kansas City, 5014 Rockhill Road, SASS #210, Kansas City, MO 64110
This videotape provides a simulation of an Supplemental Instruction (SI) session in an economics class. A narrator guides the viewer regarding the activities of the SI leader and provides a debriefing of the SI session.

Garland, M., & Gordy, K. (1987). *Supplemental Instruction in the context of critical thinking*. Unpublished manuscript. The University of Missouri-Kansas City. Kansas City, MO.
This manuscript describes how the Supplemental Instruction program can be used to promote critical thinking skills of students. This goal is supported through SI session activities. Independent thought is fostered through session strategies that require students to work privately before group discussions are facilitated. Creating a learning environment in SI sessions where students feel comfortable to talk promotes active learning and vocalizing of ideas. A third component needed by critical thinking proponents is "reflection" when students begin to understand their own thinking processes. SI sessions focus not only on the course content, but also on the process of learning and thinking about it. The SI leader vocalizes when they are thinking about as they consider the material and solving the problems. SI participants are also encouraged to vocalize their thinking process and their uncertainties as well.

Garland, M., & Gordy, K. (Writers). (1989). National teleconference on Supplemental Instruction [Videotape]. In J. Connett & C. B. J. (Producer). Kansas City, MO: United States Department of Education, National Diffusion Network.Available: Center for Supplemental Instruction, University of Missouri-Kansas City, 5014 Rockhill Road, SASS #210, Kansas City, MO 64110
This live national teleconference featured an overview of the Supplemental Instruction (SI) model. Also included were interviews with SI leaders and faculty members who had SI attached to their classes. A live call-in portion of the teleconference permitted members of a national audience to call in with questions.

Garland, M., & Jamerson, L. (Writers). (1988). Supplemental Instruction: A validated model of student academic support [Audio cassette], *The 1988 National Conference on Higher Education, Washington, D.C.* Glendale, CA: Mobiltape Co.
Taped at the 1988 National Conference on Higher Education in Washington, D.C., two experts from the Supplemental Instruction (SI) program at the University of Missouri-Kansas City discuss their experience with SI, a nonremedial model of student academic assistance that targets historically-difficult courses rather than high-risk students. They provide an overview of the model and its use with a variety of student subpopulations.

Garland, M., Minkoff, D., & Zerger, S. (Writers). (1995). The use of Supplemental Instruction in small classes and small colleges [Videotape]. In D. Arendale (Producer). Kansas City, MO: Center for Supplemental Instruction, The University of Missouri-Kansas City
This videotape records a panel discussion regarding the advantages and challenges of Supplemental Instruction (SI) in small classes and colleges. Some of the issues included: locating SI leaders; cost effectiveness in small classes; networking with faculty members; and the use of SI in quarter and semester terms. The panelists are campus SI supervisors as well as Certified Trainers with the SI program.

Garvin, A., & Snyder, D. (2001). MASH (Math and Science Help): Supplemental Instruction at a technical university. In J. E. Miller, J. E. Groccia & M. S. Miller (Eds.), *Student-assisted teaching: A guide to faculty-student teamwork* (pp. 82-86). Bolton, MA: Anker Publishing Company. Retrieved from ERIC database. (ED449713).
This chapter describes the use of Supplemental Instruction (SI) at Worcester Polytechnic Institute (WPI) located in Worcester, Pennsylvania. WPI is the nation's third oldest private engineering college. The name given to the Supplemental Instruction (SI) program is MASH (Math and Science Help) for purposes of marketing to students and faculty members. The focus of MASH was with students enrolled in Calculus I and II, Physics I and II, and Chemistry I and II. Data from a Fall 1999 study suggested higher final grades for the MASH attendees in comparison to nonattendees. Based on student utilization, the program appears to be cost effective since the unit cost of offering MASH to a student is approximately $24 annually.

Gattis, K. W. (2000). Long-term knowledge gains due to Supplemental Instruction in college chemistry courses. *Journal of Research and Development in Education, 33*(2), 118-126.
This article examined the effectiveness of a Supplemental Instruction (SI) program for undergraduate chemistry courses at North Carolina State University (Raleigh, NC). The SI program was evaluated through the effects of academic preparation, fall SI attendance, and spring SI attendance on spring chemistry grades. In Experiment #1, 437 undergraduate students were enrolled in Chemistry I in the fall semester and Chemistry II in the spring; results show that SI exerted a significant positive effect on spring course grade. Following changes made to the Chemistry I course, 148 students in Experiment #2 proceeded from fall Chemistry I to Chemistry II or Organic Chemistry I in the spring. Results show that those attending SI in both fall and spring semesters obtained the highest grade scores in the spring term. Findings suggest both short-term and long-term benefits of SI attendance. SI sessions can enhance long-term retention of concepts, improve problem-solving skills, and build conceptual frameworks for future learning.

Gattis, K. W. (2002). Responding to self-selection bias in assessments of academic support programs: A motivational control study of Supplemental Instruction. *The Learning Assistance Review, 7*(2), 26-36.
A motivational control study of students participating in Supplemental Instruction (SI) sessions in college chemistry at North Carolina State University showed that participants benefit from SI sessions to an extent that cannot be explained by their higher levels of motivation. Motivation is shown to be an important factor in grade performance whether students use SI or not. Actual SI attendance is shown to provide additional grade benefits. Students who had initially indicated high motivation to attend SI and attended SI four or more times during the academic term earned statistically significantly higher final course grades than similar students who attended SI between one and three times or students who were highly motivated but did not attend SI. The highly motivated students who attended SI four or more times earned dramatically higher grades than students who were not highly motivated and did not attend SI. The effectiveness of SI is thought to be due to enhanced interactivity. SI provides students

with a productive hour of learning, featuring a psychologically safe environment for asking questions and opportunities for guided practice.

Gentner, N. (1997, 1997, April 22). Queensland University of Technology to push Supplemental Instruction in local units, *Inside QUT (Queensland University of Technology Newspaper),* p. 11.
This newspaper article contains an interview with Kathy Phillips, Supplemental Instruction campus coordinator from The University of Missouri-Kansas City who was spending an academic term at the Queensland University of Technology (Australia). The SI program was started at QUT by Professor Ron Gardiner, then Associate Pro-Vice-Chancellor (Academic) in 1992. At present SI is offered to 1,000 students in 12 course units in four faculties.

Gibbon, M., & Saunders, D. (1998). Peer tutoring and Peer-Assisted Student Support: Five models with a new university. *Mentoring & Tutoring, 4*(3), 165-176.
Peer-Assisted Student Support (PASS) is based upon Supplemental Instruction (SI) and is the predominate name used in the United Kingdom. This article provides an overview of PASS.

Gilinsky, R. (1985, 1985, October 20). Extra effort, *New York Times Newspaper,* p. 3.
This newspaper article provides an overview of the Supplemental Instruction (SI) program at the State University of New York at Purchase. The SI program is funded through a grant from the Xerox Corporation.

Gill, D., Parker, C., Spooner, M., Thomas, M., Ambrose, K., & Richardson, J. (2006). Tomorrow's doctors and nurses: Peer assisted learning. *The Clinical Teacher, 3*(1), 13-18. Retrieved from http://www.theclinicalteacher.com.
This article describes the use of Peer Assisted Learning (PAL) in the United Kingdom to improve achievement for health science students at the Royal Free and University College London Medial School and the School of Health and Social Sciences at Middlesex University. PAL is based upon the Supplemental Instruction (SI) model. Senior nurses served as the PAL leaders for the first-year students. Outcomes for the PAL leaders included gains in confidence, knowledge of the subject material, gains in teaching and clinical examination skills, and an opportunity to enhance interprofessional relationships.

Ginns, I. S., & Watters, J. J. (1995). *Final Report of Peer Assisted Study Sessions in Science Foundations MDB303*. Unpublished manuscript. Queensland University of Technology. Brisbane, Queensland, Australia.
This report describes the use of Peer Assisted Study Sessions (PASS) with students at Queensland University of Technology (Brisbane, Queensland, Australia). PASS is the term used at the institution for Supplemental Instruction (SI). Students enrolled in the Primary and Early Childhood strands of the preservice Bachelor of Education program are required to undertake basic studies of science in their first year. This core unit (Science Foundations - MDB303) was the course proposed for PASS. The performance of the students were examined on a 1 to 7 scale (1 to 3=fail, 4=pass,

5=credit, 6=distinction, 7=high distinction). The PASS group earned a statistically significant ($p < .01$) higher mean final course grade of 4.88 as compared with 4.15 for the non-participants. No PASS participants earned a failing grade while 8 of the non-participants did so. The PASS group earned grades of distinction or high distinction 66 percent of the time compared with 28 percent for the non-participants. Interviews with PASS participants identified the following changes: more thorough understanding of scientific concepts; identified ways of engaging the course content; study methods improved; established more consistent study times; attitudes towards science improved; and overall confidence increased. PASS leaders mentioned the following changes for themselves: increased confidence in teaching skills; enjoyed working in groups.

Glesner Fines, B. (2003). *Structured Study Groups at the University of Missouri-Kansas City School of Law*. Unpublished manuscript. University of Missouri-Kansas City. Kansas City, MO. Retrieved from
http://www.law.umkc.edu/faculty/profiles/glesnerfines/SSG.html
This short abstract describes the adaptation of the Supplemental Instruction (SI) program for use at the School of Law at the University of Missouri-Kansas City. The SI program is called the Structured Study Groups.

Gordy, Z. K. (1987). *Supplemental Instruction in the context of critical thinking.* Conference Proceedings of the Intellectual Skills Development Association Conference, San Diego, CA.
This paper describes the use of Supplemental Instruction (SI) to increase the level of critical thinking by students enrolled in historically difficult college courses.

Gordy, Z. K., & Garland, M. (1987). *Improving college-level thinking through Supplemental Instruction*. Unpublished manuscript. The University of Missouri-Kansas City. Kansas City, MO.
The authors describe the use of Supplemental Instruction (SI) to increase the level of thinking by college students. Since SI sessions incorporate a reflective approach to learning, the SI leader creates an environment for students to increase their level of critical thinking. Not only do the SI sessions focus on review of course content, but also through active discussions, students become more aware of their own thinking process.

Gravina, M. (1990). *Supplemental Instruction and enhanced performance in social science classes*. Paper presented at the National Social Science Association, Louisville, KY.
This article provides an overview of the Supplemental Instruction (SI) program.

Gravina, M. (1990). *Supplemental Instruction: A collaborative experience*. Paper presented at the Southeastern Conference on At-Risk Students, Savannah, GA.
This article provides an overview of the Supplemental Instruction (SI) program.

Gravina, M. (1990). *Supplemental Instruction: A continuation of the goals of the Freshman Year Experience.* Conference Proceedings of the Freshman Year Experience Conference, Austin, TX.

This article provides an overview of the Supplemental Instruction program.

Gravina, M. (1990, 1990). *Supplemental Instruction: Success with diverse student populations.* Conference Proceedings of the Conference Proceedings of the Minority Student Today Conference, San Antonio, TX.
This article provides an overview of the Supplemental Instruction (SI) program. Data suggests that the SI program is helpful for all students, regardless of their ethnic background or previous levels of academic preparation.

Gravina, M. (1991, 1991). *Supplemental Instruction: A continuation of the goals of the Freshman Year Experience.* Conference Proceedings of the Proceedings of the Freshman Year Experience Conference in Kansas City, MO, Kansas City, MO.
This article provides an overview of the Supplemental Instruction program.

Gravina, M. (1991, 1991). *Supplemental Instruction: A continuation of the goals of the Freshman Year Experience.* Conference Proceedings of the Proceedings of the Freshman Year Experience Conference in Long Beach, CA, Long Beach, CA.
This article provides an overview of the Supplemental Instruction program.

Gravina, M. (1991). *Supplemental Instruction: A continuation of the goals of the Freshman Year Experience.* Conference Proceedings of the Freshman Year Experience Conference, Tampa, FL.
This article provides an overview of the Supplemental Instruction program.

Gravina, M. (1991). Supplemental Instruction: SI for "at-risk" courses. *Freshman Year Experience Newsletter, 3*(4), 8.
This newsletter article provides an overview of the Supplemental Instruction (SI) program.

Gravina, M., & Adams, B. (1991). Supplemental Instruction: Integration of approaches to help high-risk students *Youth at-risk: A resource guide* (pp. 67-74). Lancaster, PA: Technonic Publishing Company, Inc.
The book chapter describes the use of Supplemental Instruction (SI) to assist students who have been predicted to be of academic risk at the institution.

Green, D. (1990). Student mentors fight departmental attrition. *Academic Leader: The Newsletter for Academic Deans and Department Chairs, 6*(3), 2.
This newsletter article provides an overview of the Supplemental Instruction (SI) program. In addition to comments from SI's creator, Deanna Martin, it also provides a quotation from Professor Lowell Orr at Kent State University who is using SI in his two biology courses. Orr supports the SI program since the SI leaders help participants to develop their own problem-solving skills.

Grier, T. (2004). Supplemental Instruction and noncognitive factors: Self-efficacy, outcome expectations, and effort regulation. *The Learning Assistance Review, 9*(2), 17-28.

The study reported in this articles examined the relationship between Supplemental Instruction (SI) and noncognitive factors such as self-efficacy, effort regulation, and outcome expectations. The student population studied were first-year TRiO students who participated in SI for two semesters, those who participated for one semester, and those that did not participate in any SI. The MSLQ instrument was used to gather data from the students. The results of the study did not reach statistical significance. The researcher speculated that it may have been due to a lack of sensitivity by the MSLQ instrument for the study, the other variables at work within the lives of the students, or other causes. Since other studies have reported some impact of SI with noncognitive variables (see Visor publications), this area warrants further review and research.

Grillo, M. C., & Leist, C. (2014). Academic support as a predictor of retention to graduation: new insights on the role of tutoring , learning assistance, and Supplemental Instruction. *Journal of College Student Retention: Research, Theory and Practice, 15*(3), 387-408.
This study examined the relationship between the long-term use of academic support services such as tutoring, learning assistance, and Supplemental Instruction and retention to graduation. Little research has been devoted to the relationship between academic support and retention to graduation in both the literatures on retention and academic support. The authors use 6 years of data from the University of Louisville's Resources for Academic Achievement unit (REACH) to test the hypotheses that a larger quantity of time spent engaged in academic support services is associated with a higher likelihood of graduation and that cumulative GPA mediates the relationship between hours spent using academic support and graduation. The findings support these hypotheses, suggesting a relationship between academic support and retention to graduation that should be given serious consideration by scholars and administrators. Students' active engagement in academically focused sessions with their peers serving as tutors, LA and SI leaders may have provided multiple benefits. For example, not only did these interactions help students understand or clarify difficult concepts in a content course, but additionally, these interactions may have improved the motivation to learn, the understanding of the process of learning, and the development of study strategies. Each of these factors could be future avenues of additional research focused on the relationship of academic support and retention. Regardless of which benefit may have most assisted students who used academic support services, this engagement outside of the classroom seems to have contributed to their academic or social integration to the extent that these students were more successful in their courses as evidenced by earned GPA which then contributed to their retention at the university. The results of this study suggest that the positive impact of this engagement with academic support services was long-term and associated with graduation. This study also found the quantity of hours spent in academic support was related to students' mean GPA, where more tutoring hours led to higher GPAs which then led to a higher likelihood of graduating. This evidence supports the pragmatic advice frequently given by academic support professionals who emphasize, especially to first-year students, the benefits of engaging in academic support services early and often during the semester. Higher GPA has been associated with college graduation in previous research studies and is commonly acknowledged (Harackiewicz, Barron, Tauer, & Elliot, 2002; Ishitani, 2003).

The data analysis for this study offers additional evidence for this claim. The higher students' earned GPA, the more likely the students were to graduate. As mean GPA increased, the likelihood of graduating increased. For this study, students who maintained higher GPAs engaging in academic support services may have improved their confidence in their own ability to learn or contributed to developing a sense of empowerment or self-efficacy necessary for college success. A last finding of this study suggests that traditional predictors of college readiness (high school GPA and standardized test scores, e.g., ACT or SAT scores) did not have a statistically significant relationship to the likelihood of students' graduating. This finding supports other retention research which suggests the complexity of identifying the components necessary to predict college success beyond those academic skills measured by high school grades and standardized test scores at the time of admission (Geiser & Santelices, 2007; Pascarella et al., 2006).

Grise, D. J., & Kenney, A. M. (2003). Supplemental Instruction in biology. *Journal of College Science Teaching, 33*(2), 18-21.
This article examines the use of Supplemental Instruction (SI) at Southwest Texas State University in a three-credit nonmajors biology course without a lab during 2000 BS 2001. Data were analyzed by ANCOVA with their grade point average used as the covariate. The researchers noticed differences in student performance based on the size of the class lecture with less participation in the larger class. It was noted that SI attendance was quite low for the participants with a common attendance pattern of only once during the academic term. The class instructor chooses to make SI attendance voluntary, but shares data studies on the effectiveness of SI with the students with the hope of motivating their participation.

Guinane, J. M. (1991). *The impact of Supplemental Instruction on the academic performance of "at-risk" students.* (Master's of Arts in Education thesis), Gratz College, , Melrose Park, PA.

Gunning, F. (1993). Supplemental Instruction is not teaching. *The Lecturer (The University & College Lecturers' Union)*, 2.
This article describes how Supplemental Instruction (SI) is not used as a replacement for teaching by course instructors. The author is a professional tutor at Kingston University in England and is a member of the teacher's union. The author describes the unique benefits that SI provides for students: peer support; modeling of study strategies; focuses on learning, not teaching. Faculty and tutors that have SI attached to their courses are supportive of the SI program since it provides different services to students than their provide. They see no conflict in roles for them.

Habley, W. R., & McClanahan, R. (2004). *What works in student retention?* (Report). American College Testing, Inc. Iowa City, IA. Retrieved from http://www.act.org/path/postsec/droptables/pdf/AllColleges.pdf
This followup to the classic 1980 and 1987 reports is a comprehensive national study of college student retention practices. Eighty-two academic intervention strategies were analyzed for their potential impact on student persistence. The top five strategies were:

freshman seminar, tutoring programs, advising interventions, mandated course placement testing program, and comprehensive learning assistance center. Among learning support activities, Supplemental Instruction was a significant factor.

Hafer, G. R. (2001). Supplemental Instruction in freshman composition. *Journal of Developmental Education, 24*(3), 30-32, 34, 36-37.
In the past, Supplemental Instruction (SI) has been underutilized in freshman composition courses particularly because of misperceptions regarding the nature of composition and the notion that the writing laboratory provides the only needed assistance programs. This article examines those assumptions and explores how success is measured in the composition classroom. It argues that the goals and method of freshman composition and SI are complementary. The conclusion outlines a pilot SI program, modified for a freshman composition classroom, that supports writing strategies and appropriate behaviors for students.

Hakizimana, S., & Jurgens, A. (2013). The Peer Teaching/Learning Experience Programme: An analysis of students' feedback. *Alternation Special Edition 9*, 99-127. Retrieved from http://alternation.ukzn.ac.za/docs/20.6/06%20Hak.pdf.
Freire's views on the dialectical nature of teaching and learning inspired a group of postgraduate students who had previously been involved in facilitating Supplemental Instruction (SI) but observed low student participation. After reflecting on their own experiences the group initiated a discussion forum for first year biology students with the aim of transforming student learning from a relatively passive experience to an active, engaging process. In contrast to the SI programme Peer Teaching/Learning Experience Programme (PTLEP) sessions were characterized by large student numbers per session (100 to 300), a much longer duration (up to 3 hours), and they were conducted at weekends or after hours. Furthermore sessions were offered only close to exams and tests with two sessions per test and three sessions per exam. In the PTLEP tutorials, facilitators guide the process and make comments, but only after the students themselves have made suggestions on how to answer questions correctly. Records from the attendance registers, evaluation questionnaires given to a sample of students attending the programme, and video recordings of sessions revealed that PTLEP increased attendance and active participation of the attending students. These multi-layered peer interactions mitigated the effects of the high student-lecturer ratios observed at the University of KwaZulu-Natal and offered pedagogical benefits as competition was decreased among students and cooperation, motivation, self-confidence and self-esteem were increased. Contrary to the belief that peer teaching should be limited to peer discussion in small groups, the s students' responses to a set of questionnaires and their participation in academic workshops indicate that, in an African context, peer education involving large numbers of students creates a motivating learning environment

Hall, P. T. (1992). Use of Supplemental Instruction at the University of Missouri-Kansas City School of Law. In D. C. Martin & D. R. Arendale (Eds.), *Supplemental Instruction: Improving first-year student success in high-risk courses* (2nd ed., pp. 38-39). Columbia, SC: National Resource Center for The Freshman Year Experience and

Students in Transition. Retrieved from ERIC database. (ED 354839). Retrieved from https://netfiles.umn.edu/users/arend011/www/peer/SIFYEmonograph.pdf.
The author describes the use of Supplemental Instruction with first-year "special-admit" law students at the University of Missouri-Kansas City. SI sessions were offered in Introduction to Law, Contracts I, Property I, and Criminal Law. While special admit students were directed to participate in the SI sessions, the program was open to all students enrolled in the four courses. Research suggests that the SI program assisted students to earn higher grades. Reenrollment rates for the special admit students was higher than before the introduction of the SI program.

Hamilton, S., Blakeley, R., Critchley, C., Playford, J., Kelly, B. A., McNamara, E., & Robertson, R. (1994). *Supplemental Instruction at the University of Queensland: A pilot program*. Unpublished manuscript. University of Queensland. Brisbane, Queensland, Australia.
The project at the University of Queensland (Australia) investigated the effectiveness of incorporating Supplemental Instruction (SI) with two large first-level biological science subjects (Introductory Biochemistry and Plant Biology). Research studies suggest that the SI program contributed to higher final course grades for SI participants (63.2 percentile vs. 52.7 percentile). The following factors were cited as important for program success: financial commitment by the academic department; availability of an experienced SI coordinator; selection and training of appropriate SI leaders; and full support of the program and the leaders by academic staff associated with the subject.

Hand, J. (2003). *Framework fidelity in an entry level biology Supplemental Instruction program*. Unpublished manuscript. Southwest Texas State University.
The research question "do the experiences of students participating in the first year Supplemental Instruction (SI) program in the entry-level biology program at Southwest Texas State University resonate with the frameworks in which the SI model is grounded?" was investigated using qualitative inquiry within a phenomenological epistemology. The purpose of the study was to determine if the experiences of five students, participating full time in a SI program for an entry-level biology curriculum, resonated with the frameworks underlying the SI model. Analysis of transcriptions of open-ended interviews with the study participants revealed that students participating in the entry-level SI sessions were experiencing phenomena reflective of the frameworks under girding the SI model. This tentative, theoretical construct of "framework fidelity" emerged as grounded theory from the qualitative study. These findings suggest that if the SI model is implemented with fidelity, the educational and developmental theories that underpin the model will resonate in a way that produce predictive, desired and expected results in student cognitive and affective domains.

Harding, A., Engelbrecht, J., & Vervvey, A. (2011). Implementing Supplemental Instruction for a large group in mathematics. *International Journal of Mathematical Education in Science and Technology, 42*(7), 847-856.
The Supplemental Instruction (SI) programme has been well-established worldwide and the resulting success of the programme is indisputable. The University of Pretoria has decided on SI as the model to be used for addressing the underpreparedness of

students entering the university, largely brought about by the changes in the curricula at secondary school level. The SI model was piloted in two courses, one in mathematics and another in chemistry, each consisting of more than a thousand students. This article addresses implementation issues of SI for such a large group of students in mathematics. It cautions would-be implementers to pitfalls and shortcomings of the SI model and suggests how the model could be adapted to answer the current needs. This article also shows that despite problems in strictly adhering to SI principles in the implementation of the programme, participants showed increased performance.

Harrington, J., & Moore, D. (1986). *Say "Si" to supplementals*. Paper presented at the 7th Annual Meeting of the Rocky Mountain Regional Conference of the International Reading Association, Colorado Spring, CO. Retrieved from ERIC database (ED270739).
This paper provides an overview of the Supplemental Instruction (SI) program. The authors describe a pilot test of the SI program with a Spanish class at the University of Nebraska-Omaha. Lessons learned from the pilot test of SI included: tie SI sessions to one course taught by one instructor; hire staff leaders for sessions; provide adequate feedback and constructive criticism for session leaders; and inform students that SI session attendance is not a substitute for independent studying.

Haskell, D. H., & Champion, T. D. (2008). Instructional strategies and learning preferences at a historically Black university. *Journal of Negro Education, 77*(3), 271-279.
Through the Minority Biomedical Research Support-Research Initiative for Scientific Enhancement program, the natural sciences faculty at Johnson C. Smith University, a historically Black university, works to support their students' learning. The heterogeneity of learning preferences among students challenges the faculty to provide a variety of instructional methods. Supplemental Instruction was a particularly popular and effective strategy. Results include an increasing trend in number of JCSU Natural Sciences graduates.

Haunwitz, R. K. M., & Heinauer, L. (2005, 2005, February 6). Colleges left behind, *American-Stateman Staff Newspaper,* p. A1.
This newspaper article describes the use of Supplemental Instruction (SI) at the University of Texas-San Antonio.

Hawthorne, J., & Hawthorne, J. W. (1987). *Separating the wheat from the chaff: Finding the unique effect of Supplemental Course Instruction*. Unpublished manuscript. Olivet Nazarene University. California. Retrieved from ERIC database. (ED328201)
Supplemental Instruction (SI) at Olivet Nazarene University (CA) was examined through a study utilizing path analysis. Confounding factors such as the voluntary nature of the study sessions and the open admission policy of the college were controlled through path analysis/structural equation modeling. The analysis studied: 1) the effect of factors affecting SI participation, such as high school rank, marital status, semester load, and expected grade; and 2) the effects of SI participation on course grade, semester grade point average, and re-enrollment. Overall, path analysis explained 12.5

percent of the total variance of SI participation. Three of the exogenous variables have a direct, statistically significant, impact on SI participation: 1) The study found that the more a student is "at-risk" the more likely he or she is to use SI. 2) There is a direct positive effect between reported high school grades and SI participation. 3) The longer the student has been out of high school, the less likely he is to use SI. Two endogenous variables also have direct impacts on SI participation: 1) The more a student works, the less likely he is to attend SI sessions. 2) Students who expect to do well in the course are significantly more likely to attend SI sessions. SI participation had significant direct effects on course grade, semester GPA, and reenrollment. Since there was direct effects of SI on grade point average and semester grade point average, the authors suggest the transfer of study skills learned to other courses.

Healy, C. E. (1994). Introducing Supplemental Instruction in engineering. In C. Rust & J. Wallace (Eds.), *Helping students to learn from each other: Supplemental Instruction, SEDA Paper 86* (pp. 25-30). Birmingham, England: Staff and Educational Development Association
This chapter describes the implementation of Supplemental Instruction in engineering courses at Glasgow Caledonia University in Scotland. The University is seeking to initiate cultural change through partnership events involving students, staff and employees. Research studies suggested improvements by both the SI participants (64.8 percentile vs. 54.4 percentile for non-SI participants) and the SI leaders. Some SI leaders reported that they had now considered pursuing a teaching career based on the positive experience with the SI program.

Healy, C. E. (1994). Supplemental Instruction: A model for supporting student learning. In J. Wallace (Ed.), *Kingston University HEFCE Supplemental Instruction Project: 1993-94* (pp. 231-236). London, England: Kingston University
The study investigates the effectiveness of Supplemental Instruction at the Glasgow Caledonian University. Preliminary results indicate: a) improved performance in the students' annual examinations (e.g., Electrical Engineering Principles: 61 percentile vs. 46 percentile for non-SI participants); b) reduction in students' drop-out rates; c) enhanced communication and other transferable skills and d) deeper understanding of engineering principles.

Healy, C. E. (1994). Supplemental Instruction: A model for supporting student learning. In H. C. Foot, C. J. Howe, A. Anderson, A. K. Tolmie & D. A. Warden (Eds.), *Group and interactive learning*. Southampton, England: Computational Mechanics Publications
The authors reported improved performance in annual examination results of Supplemental Instruction (SI) students as well as reductions in dropout rates, coupled with enhanced communication and other transferable skills and a deeper understanding of the principles of engineering at the British higher education institution.

Healy, C. E. (1994). *Supplemental Instruction: A model for supporting student learning.* Conference Proceedings of the International Conference on Group and Interactive Learning, Glasgow, Scotland.

This article describes the implementation of Supplemental Instruction in engineering courses at Glasgow Caledonia University in Scotland. The University is seeking to initiate cultural change through partnership events involving students, staff and employees. Research studies suggested improvements by both the SI participants (64.8 percentile vs. 54.4 percentile for non-SI participants) and the SI leaders. Some SI leaders reported that they had now considered pursuing a teaching career based on the positive experience with the SI program.

Heerspink, J. B. (1997). *The use of spatial representation in history courses and in courses with historical content*. Unpublished manuscript. Calvin College. Grand Rapids, MI.
Students who learn to represent historical information spatially will find their learning to be both more complete and more efficient. The Supplemental Instruction (SI) leader has a significant role to play in bringing experience in learning history and in the use of learning strategies in the SI sessions. Five typical spatial representation patterns of learning in history courses include: sequence, parts/types/lists, compare/contrast, cause and effect, PERSIA (political, economic, religious, social, intellectual, and/or artistic factors). The author is the tutor coordinator at Calvin College (Grand Rapids, MI).

Heil, A. (2009). *Impact of Supplemental Instruction on achievement of technical college students in college algebra.* (Ph.D. dissertation), Georgia State University. Retrieved from https://getd.libs.uga.edu/pdfs/heil_alysen_s_200912_edd.pdf
Increasingly, students are enrolling in college who are less prepared for college academics, and require remedial courses. The Supplemental Instruction (SI) program is one remedial program that may aid in student success in college level courses. Supplemental Instruction is an academic assistance program, which employs instructor specific peer tutoring. An experimental study, as designed at a 2-year technical college in Georgia, was used to examine the usefulness of SI in supporting student achievement in college algebra. Supplemental Instruction was conducted for a randomly assigned group of students for the first 5 weeks of a 10-week quarter. Upon completion, students completed a midterm achievement assessment between those who participated in SI and those who did not. The results were not statistically significant, meaning that statistically there was no difference between those students who participated in Supplemental Instruction and those who did not participate.

Henry, M. (1998, 1998, February 27). Faculty senate applauds recommendations, *Lubbock Avalanche-Journal,* p. 7c.
This newspaper article discusses the steps that Texas Tech Chancellor John Montford outlined to enhance academic performance of student-athletes. Supplemental Instruction (SI) was among the suggested activities. Four classes with high concentrations of student-athletes have SI provided as a service with an expansion to 10 to 12 classes for the following fall 1998 academic term.

Hensen, K. A. (2005). *Examining the relationship between Supplemental Instructors (SI) and student retention at a doctoral extensive institution.* (Ph.D. dissertation), Iowa State University, Ames, IA.
This study tracked 3,286 students over a five-year period who were enrolled in entry-level biology, chemistry, mathematics, and physics courses offering SI in the fall 1999 to see if they were retained or graduated at a Midwestern doctoral extensive institution and identified which predictor variables (demographic, achievement, and level of SI participation) most significantly predicted student retention or graduation. Chi-square analysis, based on two-way contingency tables indicated that SI participants are retained at higher rates than non-SI participants while having lower mean ACT composite scores and fewer semesters of high school preparation in calculus, chemistry, and physics. Backward stepwise multiple logistic regression analysis was used to determine that the most significant predictor of student retention/graduation was high school rank. Positive predictors for the various disciplines across the five year period included the number of SI sessions attended the number of transfer credits earned, and the number of semesters of high school calculus, chemistry, or physics. Negative predictors of student retention or graduation included Pell Grant eligibility and being a member of ethnic minority group. The results of this study, in addition to making a significant contribution to literature on retention and SI, also have implications for institutional practice. Specifically, this study provides a model for evaluating SI programs or other academic support programs to demonstrate how the program helps retain students. The findings also may be used to inform institutional leaders, policymakers, and the public about how SI is a useful tool to retain students and encourage the expansion of SI programs to meet the needs of additional learners.

Hensen, K. A., & Shelley, M. C. (2003). The impact of Supplemental Instruction: Results from a large, public, Midwestern university. *Journal of College Student Development, 44*(2), 250-259.
This article describes the use of Supplemental Instruction (SI) at Iowa State University. The SI program was established in 1992 and serves 60 sections of biology, chemistry, math, and physics courses with a combined enrollment of approximately 7,500. About 22% of students in these courses attend SI sessions one or more times during the academic term. There was statistically significant differences favoring the SI participants regarding higher rates of A & B final course grades (9% higher), lower rates of D, F, and withdrawals (8% lower), and higher mean final course grades (one-third of a letter grade higher). Regarding preentry attributes (e.g., ACT scores), the SI participants in biology, chemistry, and math had statistically lower scores and were less academically prepared than their non-SI participants. In physics, there was no statistical difference. This suggests that preentry attributes do not explain the reasons for higher academic performance by SI participants, especially since most SI participants were less academically prepared.

Hensley, D. (1997, 1997, February 27). Montford vows to set new pace for Texas Tech University athletes, *Lubbock Avalanche-Journal,* p. 7c.
The Chancellor of Texas Tech University (Lubbock, TX) announces that the Supplemental Instruction (SI) program will be expanded at the institution as part of a

comprehensive increase in academic support services for student-athletes. Due to several highly-publicized cases of poor academic performance by several athletes, the institution will provide: closely monitored study table; SI provided in more classes; tutors to students when they are out-of-town for athletic contests; and more closely monitored class attendance.

Hibbert, T. D. (1996). *Taking study skills to the classroom: Supplemental Instruction as an integral part of college courses.* (Master's of Arts thesis), University of Texas at El Paso, El Paso, TX.
This paper studied the impact of Supplemental Instruction (SI) at the University of Texas at El Paso during Fall 1994 and 1995 in three Sociology Statistics classes and three Sociology Methods of Research classes with a total student enrollment of 269 students. These sections were chosen since the same instructor taught the three sections in each subject -- controlling for the possibility of different teaching styles. The three dependent variables studied were final course grade, semester grade point average, and re-enrollment at the university the following academic term. The classes included in this study had D, F or withdrawal rates of 32 to 38 percent before providing the SI program. During Fall 1994 the researcher conducted a mandatory study session connected with each section of the sociology classes. These mandatory sessions occurred during one class period each week. In one course section the researcher conducted a traditional SI session. In the other section of the same course the researcher allowed the enrolled students to guide the session. The researcher served as a discussion facilitator. The results were mixed regarding the improvement of semester grade point averages. In the statistics course the SI group had a higher subsequent semester GPA (2.86 vs. 2.57). In the methods course the results slightly favored the non-SI group (1.98 vs. 1.90). The same pattern emerged regarding final course grades. In the statistics course the SI group had higher academic performance (percent A & B, 41.3% vs. 32.6%; D, F & W, 32.0% vs. 30.4%; mean final grade, 73.66 vs. 72.2). In the methods class the non-SI group had higher achievement (percent A & B, 55.0% vs. 48.9%; D, F, & W, 20.0% vs. 26.5%; mean final grade, 76.4 vs. 73.8). An abbreviated version of the Whimbey Analytical Skills Inventory (8 items rather than 38) and a math assessment test was administered to all students at the beginning and the end of the academic term. No significant differences were found. Analysis of student journals suggested increased confidence and enjoyment of the course content due to the experience of the supplemental study review sessions provided through both the traditional SI and the informal student-led sessions. The researcher postulated several possible reasons for no significant difference between the SI group and the informal student study groups: (1) since the same person facilitated the SI sessions and the informal student study group (non-SI) some SI activities may have been utilized during the non-SI group sessions; (2) the SI facilitator also provided additional tutorial help to the non-SI group throughout the academic term.

Hill, D. (1992). Supplemental Instruction in the social sciences at Weber State University in Ogden, UT. *Collaborative Learning Exchange Newsletter*, 10-11.
The author reports on the implementation of Supplemental Instruction at Weber State University in Ogden, Utah. In the 1991-92 year SI was offered in US History 170,

American National Government 110, Introduction to Criminal Justice 106, Introduction to Philosophy 101, and Introduction to Economics 101. In the Introduction to Criminal Justice 106 course the SI participants earned a higher percent of A and B final course grades (80% vs. 53%). The article described some of the SI session activities for the social science courses: cause and effect; comparison and contrast; short writing activities; review of elements of research reports; review lecture note taking strategies; integration of outside reading assignments with lecture notes; and interpretations of reading assignments.

Hill, S., Gay, B., & Topping, K. J. (1998). Peer-assisted learning beyond school. In K. Topping & S. Ehly (Eds.), *Peer-assisted learning* (pp. 291-311). London: Lawrence Erlbaum Associates, Publishers
This book chapter provides a wide overview of peer-assisted learning (PAL) programs. The first part deals with cross-age tutoring programs. This most often involve college students working with young people. It is common for student tutors to report growth in improved communication skills, self-confidence, cognitive gains. The studies have had mixed results concerning cognitive gains by the tutees. More common improvements are reported with the social and affective domains. The authors report substantial and persuasive evidence of impact on dropout rates, course grades, and graduation outcomes.

Hillman, J. C. (1996, 1996). *The value of Supplemental Instruction in conceptual learning.* Conference Proceedings of the 4th AFRICON Conference, Piscataway, NJ.
Undergraduates have difficulty with courses that are conceptual in nature. The internalization of concepts and the development of problem solving skills is achieved by individuals in a variety of ways, relatively few of which are known by lecturers or actively sought. Supplemental Instruction (SI) can overcome these problems by encouraging students to learn from the experiences of others by participating in structured group discussions which are facilitated by senior students. This paper describes the development of an SI program with a first year electrical engineering course and concludes that it is both an efficient and cost effective methods of improving student learning, particularly for those from an educationally disadvantaged background.

Hinckley, A. (1991, 1991, April). Students get paid to help others pass, *The National College Newspaper,* p. 23.
This newspaper article describes the use of Supplemental Instruction (SI) program at Utah State University. Currently SI is offered in connection with two courses: economics and nutrition/food science. The SI program is administered through the Learning Assistance Center.

Hizer, S. E. (2010). *The Supplemental Instruction program: Student perceptions of the learning environment and impact on student academic achievement in college science at California State University, San Marcos.* (Ed.D. dissertation), San Diego State University and California State University, San Marcos, California United States.
Higher education in science has been criticized and calls to increase student learning and persistence to degree has been recognized as a national problem by the

Department of Education, the National Science Foundation, the National Research Council, and the National Academy of Sciences. One mode of academic assistance that may directly address this issue is the implementation of Supplemental Instruction (SI) in science courses. SI is a specific model of academic assistance designed to help students in historically difficult science classes master course content, thus increasing their academic achievement and retention. This study assessed the SI program at California State University, San Marcos, in supported science courses. Specifically, academic achievement based on final course grades were compared between SI participating and nonparticipating students, multiple affective factors were measured at the beginning and end of the semester, and students' perceptions of the classroom and SI session learning environments recorded. Overall, students who attended five or more SI sessions achieved higher final course grades. Students who chose to participate in SI had higher initial levels of responsibility and anxiety. Additionally, SI participants experienced a reduction in anxiety over the semester whereas nonparticipants experienced an increase in anxiety from beginning to the end of the semester. The learning environment of SI embodies higher levels of constructivist principles of active learning such as cooperation, cohesiveness, innovation, and personalization -- with one exception for the physics course, which is a based on problem-based learning. Structural equation modeling of variables indicates that high self-efficacy at the end of the semester is directly related to high final course grades; this is mediated by cohesion in the classroom and the cooperation evidenced in SI sessions. These findings are elaborated by student descriptions of what happened in SI sessions and discussed given the theoretical frameworks of Bandura's concept of self-efficacy and learning environment activities that embody constructivist principles.

Hodges, R., Dochen, C. W., & Joy, D. (2001). Increasing students' success: When Supplemental Instruction becomes mandatory. *Journal of College Reading and Learning, 31*(2), 143-156.
The study found that students in both mandated and voluntary Supplemental Instruction groups in a high-risk, required, freshmen-level, writing-intensive United States history course earned significantly higher course grades and semester grade point averages than students in the non-SI group. The study found no significant differences between voluntary and mandatory SI participants.

Hodges, R., & White, W. G. (2001). Encouraging high-risk student participation in tutoring and Supplemental Instruction. *Journal of Developmental Education, 24*(3), 2-4, 6, 8, 10, 43.
The study investigated the effect of high-risk students' use of self-monitoring strategies and instructors' use of verbal prompts on high-risk students' participation in tutoring and Supplemental Instruction (SI) and one their academic achievement. Subjects consisted of 103 conditionally admitted contract students at a large state university in the southern United States enrolling approximately 21,000 students during Fall 1996. The study employed an experimental posttest-only control-group design. Results indicated no significant group differences in mean semester GPA between attendees and non-attendees in tutoring but did find a statistically significant difference between mean semester GPA of attendees and non-attendees in SI. One of the challenges with high

risk students is that they may not accurately perceive their own need for academic assistance. Possible solutions to this challenge is to make SI attendance mandatory.

Hodges, R. B. (1997). The effect of self-monitoring strategies and verbal prompts on high-risk students' attendance in tutoring and Supplemental Instruction and their academic achievement (Ph.D. dissertation, Grambling State University, 1997). *Dissertation Abstracts International, 59*(02), 0429A.
The study investigated the effect of high-risk students' self-monitoring (SM) strategies and instructors' use of verbal prompts on high-risk students' attendance in tutoring and Supplemental Instruction (SI) and on their academic achievement. Subjects consisted of 103 conditionally admitted contract students at Southwest Texas State University during fall 1996. Using an experimental posttest-only control-group design, instructors in four freshman seminar classes implemented different combinations of treatment. In Treatment 1, subjects were required to self-monitor their attendance in tutoring and SI, and they received verbal prompts from their instructors to attend free tutoring and SI. In Treatment 2, subjects were required to self-monitor their attendance in tutoring and SI but were not given verbal prompts. In Treatment 3, subjects received verbal prompts to attend tutoring and SI but were not required to self-monitor their attendance. In the control group, subjects were not required to self-monitor their attendance in tutoring and SI and were not exposed to verbal prompts. A validation analysis of the effectiveness of tutoring and SI compared subjects attending one or more tutoring sessions and one or more SI sessions to those not attending. Using independent t-tests, the results indicated no significant group differences occurred in semester GPA between attendees and non-attendees in tutoring but did find statistically significant group difference in semester GPA for attendees in SI. Three hypotheses examined the relationship between subjects' use of SM strategies and instructors' use of verbal prompts on subjects' attendance in tutoring and SI. Two ANOVAs failed to reject the three null hypotheses which indicated that there was no increased in subjects' attendance in tutoring and SI between groups. SI attendance for this subpopulation of students was low (mean=2.27 with S.D.=3.37) when compared with national SI data studies. The researcher suggested the following reasons for low SI attendance based on student surveys and interviews: SI sessions scheduled at time in conflict with other student commitments; high-risk students have unrealistic positive perceptions regarding their own academic skills and may not seek help; and high-risk students need stronger external influences to change their behavior including the requirement of mandatory SI attendance. The researcher suggests increased attention to the affective domain and its possible impact upon student learning and the use of mandatory attendance in academic enrichment programs such as SI and tutoring.

Hodges, R. B., E, S. D., & White, W. G. (1994). Peer teaching: The use of facilitators in college classes. *Journal of College Reading and Learning, 26*(2), 23-29.
This article discusses the use of peer students as facilitators in the learning process. Supplemental Instruction (SI) is cited as another example of these student-led peer groups. The authors cite Maxwell (1992) when stating that SI is the best known and has the widest acceptance of any course-related learning program. A facilitator is defined as a facilitator as an undergraduate teaching assistant engaged in

collaboratively teaching a college course alongside the instructor. While facilitators may perform some clerical duties, the focus of their work is to foster student learning. Common activities for facilitators include: through hosting smaller outside-of-class sessions make large classes more personable; turn lecture material by asking questions; share from a student's perspective another way to think about the lecture material; provide individual feedback to students; supervise small student work groups; provide role models of active learning; give encouragement; and change the classroom climate. Critical elements for a successful facilitator: be carefully selected by the instructor and perhaps a team of other student facilitators; training both before and during the academic term; evaluation by student and self-administered surveys.

Hoi, K. N., & Dowing, K. (2010). The impact of Supplemental Instruction on learning competence and academic performance. *Studies in Higher Education, 35*(8), 921-939. This study investigated the effects of Supplemental Instruction, a peer-assisted learning approach, on students, learning competence and academic performance. The Supplemental Instruction intervention facilitated by senior students focused on developing students' use of study skills and enhancing their motivation and academic performance. Pre- and post-intervention learning competence measures (the 10 scales of the Learning and Study Strategies Inventory) were available for 430 first year undergraduate business students (Supplemental Instruction, n = 109; Non-Supplemental Instruction, n = 321) from a university in Hong Kong. Structural equation modeling demonstrated that Supplemental Instruction had a significant effect on academic performance, both directly and indirectly via enhancement of student learning competence, after controlling for pre-intervention learning strategy scores and previous academic achievement. This study provides evidence that Supplemental Instruction can be a very effective instructional strategy for promoting undergraduate student learning.

Holek, D. D. (2008). *The impact of Supplemental Instruction on the retention and graduation of students of color at "Mid-Western University".* (Ph.D. dissertation), Central Michigan University, Mount Pleasant, MI.
Understanding how students of color become socially and academically integrated into college is critical to improving their retention. Although a variety of retention programs exist, programs such as Supplemental Instruction (SI) focus on lowering the rate of attrition by promoting academic success through peer instruction, teaching effective learning methods, and study skills training. A recent study demonstrated that SI significantly improved the GPA for students of color that attended SI sessions at MWU. It was important to determine if the SI program also had an impact on the retention and persistence to graduation of students of color at MWU attending SI. The study site was unique since MWU has the only SI program, nation-wide, administered in an institutional diversity office. This unique location provided in-depth data on students of color that will contribute significantly to current research. Although much research has been conducted in the areas of SI and academic achievement, there has been minimal research performed analyzing the effect SI has on the retention and graduation rates on the population of students of color. Given this paucity of research, the purpose of this quantitative investigation was to fill this research gap by measuring the extent to which there was a difference between the retention and graduation rates of students of color

at MWU who attend SI to students of color at MWU who do not attend SI. The null hypotheses was that there would be no significant increase in the retention rate and graduation rate within each group of students of color who attend SI in comparison to student of color who do not attend SI. This quantitative investigation involved a causal-comparative, ex post facto method of research, using the Cochran-Mantel-Haenszel chi-square technique. The population of this investigation included MWU undergraduate students of color. Archival data for the time period beginning in the Fall semester of 2001 through the Fall semester of 2002 was utilized in this investigation. The students' reenrollment and graduation status at the end of the Spring semester of 2007 was analyzed in the comparison, and collected from the MWU Minority Student Services (MSS) records and MWU Office of Institutional Research. The F tests were performed on the main effects for the two factors and the interaction between the two factors. In the post hoc analysis, three summary Cochran-Mantel-Haenszel (CMH) correlation statistics were used to test for the hypothesis of no association. Differences were determined to be significant at the associated p -value of <.0005. This study concluded that SI had a significant impact on the retention and persistence to graduation for African-American, Hispanic/Latino, and Native American students at MWU. However, this study concluded that SI did not have a significant impact on the retention and persistence to graduation for Asian students at MWU. To decipher the reasons for differences by ethnicity, factors relating to ethnic identity development, learning styles and academic achievement, self-concept of academic ability, and specific social and cultural experiences and needs were reviewed to explain how and why these factors play a role in the academic achievement and retention of students of color. The literature supports that African-American, Hispanic/Latino, and Native American students often develop networks and support systems when entering college (i.e., cultural organizations), and having strong and active ties to the campus community may play a role in increased SI attendance and the impact on retention and persistence to graduation. Previous research indicated that Asian students are influenced by three key factors that may contribute to SI attendance not having a significant impact on their retention and persistence to graduation: experiences with reverse stereotype threat (i.e., living up to the stereotype that Asian's are academically superior, making it more difficulty to ask for assistance, therefore, not attending SI); being influenced by relationships and external forces; and the reaction and focus on social political consciousness identity development in the college years. It is important to note that the Asian students graduated at the same rate as the students from other ethnic groups, indicating they achieved academically through other methods. This study demonstrated the significance intervention programs such as SI have on retention, and persistence to graduation of students of color. Measurable data attained from studies such as this support the acquisition of funding, institutional understanding and buy-in, and continuation of diversity initiatives and retention programs, such as SI.

Hollenkamp, J. (1992, 1992, April 1). Supplemental Instructors help fellow students understand lectures, homework, *Louisville Cardinal Newspaper,* p. 10.
This newspaper describes the use of Supplemental Instruction (SI) with students at the University of Louisville (KY) since 1984. Each academic term SI is offered in a dozen

courses for the following academic departments: accounting, biology, chemistry, EMCS, geography, HED, history, ISDP, math, physics, political science, and sociology.

Horsley, L. (1991, 1991, September 19). UMKC pioneers a 'survival course': Study skills program gives students the help they need to succeed, *The Kansas City Star Newspaper,* pp. 1, 6.
This newspaper article provides an overview of the Supplemental Instruction (SI) program at the University of Missouri-Kansas City. The article provides an interview with Deanna Martin -- SI's creator -- as well as several other SI supervisors and SI leaders. Dr. Gary Widmar, UMKC Vice Chancellor for Student Affairs, estimates that for every dollar invested in the SI program for staff salaries, the university receives back six dollars due to higher reenrollment and graduation rates of SI participants. Martin shares that the SI program is expanding to the United Kingdom and the Arctic Circle.

Hostetter, S. (1994). Improving college student retention: Interview with David Arendale. *National Tutoring Association Newsletter*(3), 2-3.
The interview of David Arendale provided an overview of the Supplemental Instruction (SI) program. Tinto's Model of Student Retention was discussed and its relationship to explaining the effectiveness of the SI model was discussed. Data from a study of students at the University of Missouri-Kansas City suggested that SI participation with positively correlated with increased levels of reenrollment at the institution when compared with non-SI participants. It is estimated that through increased reenrollment rates, the SI program generates over $200,000 in annual savings.

Hrabovsky, P. (1998). *Math Supplemental Instruction at Indiana University of Pennsylvania: A short and sweet first report.* Conference Proceedings of the Annual Conference of the Pennsylvania Association of Developmental Educators, Hershey, PA. Retrieved from ERIC database. (ED428632)
Math Supplemental Instruction (SI) was initiated at Indiana University of Pennsylvania (IUP) during the summer session of 1996 through the developmental math course, LC 095: Introduction to College Math II. Improved grades and scores were noted and SI was integrated into all LC 095 sections beginning with the summer session of 1996. With the cooperation of the Mathematics Department and support from administrators, SI was piloted in select sections of developmental math courses. The pilot program was continued and expanded in the spring semester of 1998.

Hughes, A., Watson, R. & Boggs, C. (2008). *The Online Dilemma: Student Perceptions of Online Supplemental Instruction for General Microbiology.* Conference Proceedings of the World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education.
Supplemental Instruction (SI) is a model that has been used to enhance instruction for several decades and has seen a significant increase in popularity. Prior to the spring semester of 2008, the University of Wyoming only conducted SI in face-to-face settings. In the spring of 2008, the General Microbiology course at the university held online SI sessions. For these sessions, students were asked to read a popular non-fiction novel and discuss it online with the other students. At the end of the semester, students were

given a survey. Data at the end of the study indicated that the students perceived the exercise as beneficial, enhanced their understanding of course material, and were able to relate the information to real-word applications.

Huijser, H., & Kimmins, L. (2005). *PALS online and community building: A contradiction in terms?* Conference Proceedings of the 22nd annual ASCILITE Conference, Brisbane, Australia.
At the University of Southern Queensland (USQ), Peer-Assisted Learning (PAL) is a modified version of the Supplemental Instruction (SI) model. PAL is used to build community for the online learners. The paper reviews examples of implementing online mentoring and suggestions for improved service tot he students. Some of the suggestions included periodic face-to-face PAL sessions to offset the social isolation of the online learning activities and also to provide online photographs and short background narratives about the PAL facilitators to help acquaint them with the students participating online.

Huijser, H., & Kimmins, L. (2006). *Developing a peer-assisted learning community through MSN Messenger: A pilot program of PALS online*. Unpublished manuscript. University of Southern Queensland. Southern Queensland, Australia.
At the University of Southern Queensland (USQ), Peer-Assisted Learning (PAL) is a modified version of the Supplemental Instruction (SI) model. PAL is used to build community for the online learners. The paper reviews examples of implementing online mentoring and suggestions for improved service to the students. MSN Messenger is used as the venue for communication between the PAL facilitator and the students in the class.An economics and a data analysis class were selected for the study. The pilot program was evaluated using qualitative measures. While the online component helped to build community among the students, the initial academic outcomes appeared to be limited. The researchers encourage others to reproduce the experiment and seek to find more effective uses of the technology.

Huijser, H., Kimmins, L., & Evans, P. (2008). Peer assisted learning in fleximode: Developing an online learning community. *Australasian Journal of Peer Learning, 1*, 51-60. Retrieved from http://ro.uow.edu.au/ajpl/vol1/iss1/7
At the University of Southern Queensland in Australia use an adaptation of Peer Assisted Learning Strategy (PALS) to support online learners. This version of PAL is named Meet-Up. Since 2006 MSN Messenger has been used to serve these distance learning students. This paper describes the use of Wimba software within an institution-wide Moodle learning management system. Use of these enhancements provides a chat function, sharing of PowerPoint slides, and document sharing. This more comprehensive suite of learning tools provides more interactivity and more content sharing that the earlier use of instant messaging alone.

Hurley, K. F., McKay, D. W., Scot, T. M., & James, B. M. (2003). The Supplemental Instruction Project: Peer-devised and delivered tutorials. *Medical Teacher, 25*(4), 404-407.

The study examined the effectiveness of Supplemental Instruction Program (SIP) with undergraduate first-year medical students at Memorial University of Newfoundland in the Integrated Study of Disease I course during 1888 and 2000. The SIP program is based on the Medical Scholars Program developed at the University of Southern California which is an adaptation of Supplemental Instruction. Both qualitative and quantitative data collection methods were employed to evaluate the program. Benefits were stated for both the student participants as well as the student group facilitators who were second year medical students. The purpose of this study was to determine whether student devised and delivered supplemental instruction is beneficial and acceptable to first-year medical students. A student-run Supplemental Instruction Project (SIP) was developed and delivered by second-year medical students and offered free of charge to all first-year medical students at Memorial University of Newfoundland taking the Integrated Study of Disease I course in 1999 and again in 2000. Small-group tutorials focused on subject material that second-year medical students identified as 'difficult'. Five 60- to 90-minute sessions covering topics in cardiology, nephrology and respirology were offered. Student and tutor perceptions about the project were collected using anonymous questionnaires. Students were quizzed before and after each tutorial session. Post-tutorial quiz scores were significantly greater than pre-tutorial scores. Student and tutor perceptions of SIP were positive. It is concluded that the SIP is an acceptable, practical and effective method to supplement delivery of challenging material to first-year medical students.

Hurley, M., & Gilbert, M. (2008). Basic Supplemental Instruction model. In M. E. Stone & G. Jacobs (Eds.), *Supplemental Instruction: Improving first-year student success in high-risk courses* (Monograph No. 7, 3rd ed., pp. 1-9). Columbia, SC: University of South Carolina, National Resource Center for the First-Year Experience & Students in Transition
this chapter provides a basic overview of the Supplemental Instruction (SI) model. Topics explored within the chapter include: early history of SI at the University of Missouri-Kansas City where it was created; characteristics of the students served by SI; essential individuals needed for an effective SI program (SI leaders, SI supervisor, faculty members, participating students); and learning strategies employed during SI sessions.

Hurley, M., & Gilbert, M. (2008). Research on the effectiveness of Supplemental Instruction. In M. E. Stone & G. Jacobs (Eds.), *Supplemental Instruction: Improving first-year student success in high-risk courses* (Monograph No. 7, 3rd ed., pp. 11-19). Columbia, SC: University of South Carolina, National Resource Center for the First-Year Experience & Students in Transition
This chapter explores some of the research studies that evaluate the effectiveness of Supplemental Instruction (SI). The cited studies are those conducted by the staff at the University of Missouri-Kansas City, institutions at other U.S. institutions, and institutions outside of the U.S. Some of the cited studies focused on immediate outcomes of the SI program regarding improved final course grades and reduction of course withdrawals. Other studies examined longer-term impacts regarding increased persistence towards graduation. Other studies investigated changes in student affective domain such as self-

confidence, personal communication skills, and other areas. Regardless of institutional type, academic discipline, or student population, participation with SI increased student outcomes.

Hurley, M., Jacobs, G., & Gilbert, M. (2006). The basic SI model. In M. E. Stone & G. Jacobs (Eds.), *Supplemental Instruction: New visions for empowering student learning* (pp. 11-22). New Directions for Teaching and Learning, No. 106. San Francisco: Jossey-Bass
This general overview of the SI model looks at the SI philosophy, essential program components, program structures, key roles, outcomes, and evaluation. The chapter also reviews what has been learned about the importance of planning SI sessions, providing ongoing training for leaders, conducting regular SI program assessments, and implementing effective and essential learning strategies.

Hurley, M., Patterson, K. L., & Wilcox, F. K. (2006). Video-based Supplemental Instruction: Serving underprepared students. In M. E. Stone & G. Jacobs (Eds.), *Supplemental Instruction: New visions for empowering student learning* (pp. 43-54). New Directions for Teaching and Learning, No. 106. San Francisco: Jossey-Bass
This chapter discusses Video-based Supplemental Instruction (VSI), a variation of the SI model that presents options for students who, barring a serious academic intervention, will not be successful in college. Rather than enrollment in developmental-level courses, students enroll in a traditional introductory college course such as Western Civilization or General Chemistry. SI sessions are embedded inside of the lectures rather than waiting until after the lecture periods. Concurrent development of learning strategies along with mastery of rigorous academic content reduces the need for enrollment in prerequisite developmental-level courses.

Ilsley, G. (1994). Introducing college-wide Supplemental Instruction. In C. Rust & J. Wallace (Eds.), *Helping students to learn from each other: Supplemental Instruction, SEDA Paper 86* (pp. 65-70). Birmingham, England: Staff and Educational Development Association
Supplemental Instruction is being used at Nene College (Northampton, United Kingdom). SI was used in five courses drawn from engineering, building studies, human biological studies and information systems. Research studies suggest improvement with SI participants.

Indiana Commission for Higher Education. (1997). *Campus retention programs at Indiana public institutions: Working paper*. Unpublished manuscript. Indiana Commission for Higher Education. Indianapolis, IN. Retrieved from ERIC database. (ED431480)
This paper examines what Indiana public colleges are doing to improve the retention of students, and provides a synopsis of 12 examples of "best practices" in the state and three from other states. The commission also presents 11 observations, each accompanied by one or more possible strategies that might improve student retention. Half a dozen of the institutions provide achievement and persistence data about the impact of Supplemental Instruction with higher student outcomes.

Irwin, D., & Risser, B. (1988). *Supplemental Instruction-Plus: Levels of academic support at the community college*. Unpublished manuscript. Onondaga Community College. Syracuse, NY.
Traditional support programs at community colleges focus a great deal of attention on meeting the needs of developmental students. Supplemental Instruction PLUS (SI+) builds on that model to provide several levels of academic support all students as they are challenged. SI+ was developed at Onondaga Community College in Syracuse, NY and is a variation of the traditional SI program. However, SI+ groups have a slightly different focus since SI+ is meant to help students adjust to the demands of college courses after they have completed a sequence of developmental courses. The courses targeted by SI+ are not historically difficult and requiring the intensity of a full SI program. While the study sessions appear similar to traditional SI, SI+ leaders do not attend the course professors lectures. The SI+ leader still models effective study behavior. To keep pace with the course, the SI+ leader meets weekly with the course professor. It is anticipated that students will participate in traditional SI program when they encounter historically difficult courses in succeeding academic terms. The final stage for the SI+ program is for students to create independent study groups in other courses where SI+ and traditional SI sessions are not offered.

Jacobs, G., Hurley, M., & Unite, C. (2008). How learning theory creates a foundation for SI leader training. *Australasian Journal of Peer Learning, 1*, 6-12. Retrieved from http://ro.uow.edu.au/ajpl/vol1/iss1/3
This articles explores the theories that inform the Supplemental Instruction (SI) approach and how they link to training of SI leaders. Three elements are identified as critical for effective SI leader training: a conducive environment needs to be established to enable the SI leaders to construct theory own meaning and practice they newly acquired skills in a safe place; training should promote a social process in which students talk in order to learn through peer to peer interaction; and active learning is encouraged by simulating the experience of serving as a SI leader with a group of students.

Jacobs, G., Stone, M. E., & Stout, M. L. (2006). The new vision for SI: Where are we heading? In M. E. Stone & G. Jacobs (Eds.), *Supplemental Instruction: New visions for empowering student learning* (pp. 95-100). New Directions for Teaching and Learning, No. 106. San Francisco: Jossey-Bass
This final chapter in this monograph focuses on future uses of SI outside of its historic role of improving academic achievement for students in historically-challenging courses. Areas for new and extended uses for SI include industry, online education, and use in enhancing learning in remote learning environments throughout the world.

Jacobs, G., Stout, M. L., & Stone, M. E. (2008). Supplemental Instruction: International adaptations and future directions. In M. E. Stone & G. Jacobs (Eds.), *Supplemental Instruction: Improving first-year student success in high-risk courses* (Monograph No. 7, 3rd ed., pp. 81-90). Columbia, SC: University of South Carolina, National Resource Center for the First-Year Experience & Students in Transition

The Supplemental Instruction (SI) model has been adopted and adapted by more than 1,500 colleges and universities in more than 30 countries. Five international institutions are highlighted in this chapter: University of Manchester, United Kingdom; University of Wollongong, Australia; St. George's University, School of Medicine, Grenada, West Indies; Nelson Mandela Metropolitan University, South Africa; and Lund University, Sweden.

Jacquez, R., Gude, V. G., Hanson, A., Auzenne, M., & Williamson, S. (2007). *Enhancing critical thinking skills of civil engineering students through Supplemental Instruction.* Conference Proceedings of the ASEE.
This conference proceeding describes the use of Supplemental Instruction (SI) at New Mexico State University with civil engineering students. SI has been offered for these students since 2003. In addition to focusing on enhancement of final course grades, the SI program requires the students to exercise critical thinking skills as it involves design oriented open-ended problem solving. SI participants outperformed the nonparticipants through both their work examples as well as exam scores. There was a dramatic reduction of grades of C-D with a corresponding increase of final grades of A or B for the SI participants. Surveys of students indicated high satisfaction with the SI program. Special attention was paid during the evaluation process for the potential impact of SI with Hispanic and female students. This was important since the institution serves a high percentage of Hispanic students due to its location in New Mexico. Attention was paid for female students since they are historically underrepresented in the engineering degree programs. On both accounts, the Hispanic and female students participated at similar rates in the SI program in comparison with students from other demographic backgrounds.

Jarrett, C. J., & Harris, J. A. (2009). SI Plus: A program description and an analysis of student feedback. *The Learning Assistance Review, 14*(2), 33-42.
The purpose of this single-case descriptive study was to explore student and instructor perceptions of Supplemental Instruction in an upper-level physical chemistry course that was historically-difficult. The research took place at a doctoral/research intensive land grant university in the Northeast.The case study methodology used included a focus group, one-on-one interviews with instructors and students, document review, and class and SI statistics. Results indicated that faculty and students perceived SI to be a valuable resource in achieving persistence or academic success.

Jarvi, S. W. (1998). A quantitative and qualitative examination of Supplemental Instruction and its relationship to student performance (collaborative learning, academic support) [Dissertation, The University of Connecticut, 1998]. *Dissertation Abstracts International, 59*(05), 1484A.
Academic support programs are well entrenched on virtually every college campus. These programs have not always been warmly received, however, and their place on many campuses is a source of constant debate. They have to be evaluated effectively and often to determine if they are achieving their intended goals and contributing to the overall mission of the institution. Supplemental Instruction (SI) is one example of a support program because it utilizes peers to foster a collaborative learning environment

and targets high risk classes as opposed to high risk students. Quantitative and qualitative methodologies were employed in this study. The sample for the quantitative component included 2,295 cases of a student completing 1 of 12 introductory level Biology or Chemistry courses in which SI was offered at a large New England Research University. From the total sample, 860 students attended at least one SI session. Qualitative techniques were employed to collect data from both participants and non-participants of SI during one semester. Direct regression where the independent variables of Scholastic Aptitude Test scores, cumulative grade point average, semester standing, and level of SI participation. The dependent variable was student performance in the class as measured by average exam scores. Analyses of data found that in 7 of 12 classes involved, level of participation in SI explained a significant additional amount of variation in exam scores with accompanying large effect sizes. Qualitative findings revealed core categories related to why students attend SI: belief that SI attendance helps to raise test scores; SI sessions were fun and made participants feel more comfortable; students liked SI since it gave an opportunity to work in teams with other students; enabled attendees to stay academically competitive; and sometimes SI sessions compensated for poor lectures. The two major reasons for students not participating in SI were that time constraints precluded attendance and the other reason was a belief that SI attendance was unnecessary.

Javaher, N. (2010). *Outcome differences in participating and nonparticipating Hispanic students in Supplemental Instruction classes supporting Organic Chemistry I and II at New Mexico State University.* (Ph.D. dissertation), New Mexico State University, United States.
Lack of academic success by Hispanic students in higher education has caused university administrators to seek alternative programs to improve rates of retention and their academic success. Hispanic students are less likely than White students to complete advanced science classes, including chemistry (National Center for Education Statistics, 2006). With the shortage of an educated workforce, the nation is dependent on educating the fastest-growing ethnic/racial population. Of the 17,200 students enrolled in New Mexico State University (NMSU) in fall 2008, 40% were Hispanics, which makes the university a Hispanic-serving institution. Many programs at the university support Hispanic students, including Supplemental Instruction (SI). This study investigated whether participation in the SI program was associated with retention and better course performance among Hispanic students in Organic Chemistry courses at NMSU from 2001 through 2005. The study also examined gender differences among Hispanic students with respect to SI. The results revealed that participation in SI was, statistically, associated with retention of Hispanic students in both Organic Chemistry I and II classes and with fewer grades of D's and F's in Organic Chemistry I classes at NMSU during the mentioned semesters. The examination of gender differences revealed no significant difference; however, it was apparent that there were more female Hispanics enrolled in life sciences at NMSU compare to male Hispanics during the semesters of fall 2001 through spring 2005.This study was significant because it examined a method to retain Hispanic students in a Hispanic-serving Institution.

Jenkins, A. (1994). Thirteen ways of doing fieldwork with large classes/more students. *Journal of Geography in Higher Education, 18*(2), 143-155.
This article describes thirteen strategies for geography instructors to consider to increase instructional effectiveness with large classes. The article is addressed to geography teachers and other field-based subjects in the United Kingdom. Suggestion number suggests finding ways to add new members to the academic staff. Supplemental Instruction (SI) is suggested as a way to involve students in helping to teach each other in large classes.

Johnston, C. (1995). *Peer tutoring in economics at the University of Melbourne.* Conference Proceedings of the Australian Economic Education Symposium, Adelaide, Australia.
This paper describes an adaptation of the Supplemental Instruction (SI) model used at the University of Melbourne (Australia) in 1993. The model integrates Diploma of Education students in an undergraduate economics group learning program (Macroeconomic theory and Macroeconomic Policy). Several adaptations of the SI program: the group facilitator was a volunteer postgraduate Diploma of Education student; two wine and cheese evenings were scheduled to provide the facilitator and students to interact socially and exchange experiences with one another. It found that small groups operate more effectively in terms of group cohesion, longevity and perception of improved performance when supported by postgraduate students. Postgraduates developed an enhanced range of skills in relation to group management, cooperative learning and communication.

Jones, J. P., & Fields, K. T. (2001). The role of Supplemental Instruction in the first accounting course. *Issus in Accounting Education, 16*(4), 531-547.
This study investigates empirically the role of Supplemental Instruction (SI) as a means of enhancing student performance in the first accounting course. ANCOVA-based results from 1,359 students in nine sessions of Principles of Accounting indicates that SI was effective at increasing academic performance; after controlling for self-selection bias, participation in both voluntary and mandatory SI sessions was found to be positively associated with the total points earned in the course. Additionally, a step pattern is observed in the increased performance for both the voluntary and mandatory attendance phases of the study, indicating that the level of SI attendance may play a role in the benefits obtained. The implications of this analysis for the accounting curriculum are addressed.

Josephsen, K. (2001, 2001, October 1). Illinois State University to discuss student retention, *The Pantagraph,* p. A3.
This newspaper story describes the use of Supplemental Instruction (SI) at Illinois State University-Bloomington and its impact on increasing student retention.

Journal of Peer Learning. (n.d.). Journal of Peer Learning Web Site, Retrieved from http://ro.uow.edu.au/ajpl/
The Journal of Peer Learning (ISSN 2200-2359) publishes research articles about peer learning across a variety of contexts, predominantly higher education. *The Journal of*

Peer Learning - formerly *The Australasian Journal of Peer Learning* - is a ranked journal in the Australian Research Council's Excellence in Research for Australia (ERA) journal list. All suitable manuscripts submitted to the Journal of Peer Learning undergo a double-blind peer review process. *The Journal of Peer Learning* is open-access and does not charge authors or readers a fee. Volumes 1 to 3 of *The Journal of Peer Learning* were published as *The Australasian Journal of Peer Learning* (ISSN 1836-4306). Beginning with Volume 4, the journal publishes as *The Journal of Peer Learning*. The Editorial for Volume 4 discusses the name change.

Kastelic, J. (1997). *Adjunct study skills: An integrated, student-centered approach to learning in community college.* (Master's of Arts thesis), University of San Francisco, San Francisco, CA.
This research report describes one academic study skills program offered at a community college in northern California. It presents a variety of data to show how this integrated, student-centered, collaborative-based adjunct program affected the immediate and long term academic performance and study behaviors of its multicultural, multilingual participants. Students who enrolled in the target course in political science and concurrently completed its corresponding adjunct course over a three quarter period participated in this study. The adjunct course (Skills 130A/PS) was a variation of the Supplemental Instruction (SI) model. Students must attend at least seven weekly sessions and complete four independent study skills labs. SI leaders facilitate the adjunct course which carries academic credit and can generate extra credit points for the linked political science course (Political Science 1). A qualitative and quantitative study was conducted. The students enrolled in linked adjunct course earned higher rates of A & B final course grades, lower rates of D, F & W grades, and increased levels of study skills abilities as compared with students who did not enroll in the adjunct course.

Kastor, E. (1984, 1984, April 2). Education: Reading, 'riting and reasoning, *Washington Post Newspaper,* p. B5.
This newspaper article provides an overview of the Supplemental Instruction (SI) program and its use to develop reasoning skills. Research suggests that half of all students entering college lack the basic reasoning skills to completely understand the content of their courses. It contains an interview of Deanna Martin, creator of the SI program.

Kauffman, D., & Wolfe, R. F. (1990). Supplemental Instruction with mentoring support: A vehicle for faculty development. *The Journal of Staff, Program, and Organization Development, 8*(2), 101-104.
The Supplemental Instruction (SI) program at Anne Arundel Community College (Arnold, MD) was modified to use faculty members as SI supervisors. While this was the initial focus for the faculty members, the mentor role evolved into an opportunity for them to observe colleagues and to grow as teachers. Faculty mentors were placed in classes outside their own discipline. The classroom instructor and faculty mentor would meet periodically to provide feedback to each other and discuss strategies to improve instructional effectiveness.

Kaye, P. (1994). Introducing Supplemental Instruction in law. In C. Rust & J. Wallace (Eds.), *Helping students to learn from each other: Supplemental Instruction, SEDA Paper 86* (pp. 51-54). Birmingham, England: Staff and Educational Development Association
Supplemental Instruction was introduced at the University of Central Lancashire (United Kingdom) in the law program. While the targeted courses did not have high rates of low grades or withdrawal, there were several other reasons for their selection: enhancement of students' competencies and skills; leadership development; appreciation for learning outside of the formal classroom environment; and increased understanding of substantive legal issues.

Kelly, B. A. (1991). *Selection of leaders to facilitate Peer Assisted Study Sessions (PASS)*. Unpublished manuscript. University of Queensland, Australia.
This article describes the selection procedures for Peer Assisted Study Sessions (PASS) leaders. PASS is a locally used name at Queensland Institute of Technology and the University of Queensland in Australia for the Supplemental Instruction (SI) program. Several suggestions include distributing leaflets and encouraging former PASS participants to apply as leaders. Group interviews are used to same time and to make students feel more at ease during the interview process. To meet the need for the program to fit the institutions use of Total Quality Management (TQM), PASS leaders were asked to complete a questionnaire at the end of their PASS sessions and to maintain a diary of session activities. This information was used to improved the PASS program and provide helpful feedback to the course instructors.

Kelly, B. A. (1992). *And it came to PASS: Peer Assisted Study Sessions*. Unpublished manuscript. Queensland University of Technology. Brisbane, Queensland, Australia.
This paper discusses the development of the Peer Assisted Study Sessions (PASS) program at Queensland University of Technology (Brisbane, Australia). PASS is based upon the Supplemental Instruction (SI) model. The program was piloted in two classes in Anatomy for Nursing and Statistics for Information Technology. Research results indicated a lower rate of withdrawal and higher final course grades for participants.

Kelly, B. A. (1995). *Peer-Assisted Study Sessions: An instrument for quality assurance in high risk subjects.* Conference Proceedings of the Higher Education Research and Development Society of Australia Conference.
This paper describes the use of Peer Assisted Study Sessions (PASS), a local name for the Supplemental Instruction program as it is used at the Queensland University of Technology in Australia. The PASS program is being used as part of the institution's quality assurance (QA) system to regularly examine the needs of its customers (i.e., students enrolled in the courses that had PASS attached to them, faculty members who taught the courses, and the general community who employed the students). There was special concern for courses in which the faculty members were instructing students from other college majors. The PASS leaders served as a conduit for weekly communications with the faculty members regarding the comprehension level of the students and can make decisions regarding modifying their classroom delivery. This

"just-in-time" feedback system provides immediate benefit to the students and lectures as weekly incremental improvements can be made.

Kelly, B. A., & Gardiner, R. (1994). *Student peer mentoring: An effective strategy to promote student learning*. HERDSA Annual Conference. Unpublished manuscript.
The Peer Assisted Study Sessions (PASS) program is based upon the Supplemental Instruction (SI) program developed in the U.S. PASS was used at the Queensland University of Technology (Brisbane, Australia). A pilot program was carried out in 1992. Since then, the SI program has spread to seven disciplines in five faculties, and has attracted four 1994 CAUT grants.

Kelter, P. B., & Carr, J. D. (1996). *Personalizing the large general chemistry lecture experience*. Unpublished manuscript. The University of Nebraska at Lincoln. Lincoln, NE.
This report that includes information about the use of Supplemental Instruction (SI) was published online in connection with New Initiatives in Chemical Education, an on-line symposium, June 3 to July 19, 1996. SI was selected since it helps to provide a support structure to help individuals in the large class sections of Chemistry 109 and 110. Data from Fall 1995 showed that SI participants received a higher final course grade (2.80 vs. 1.99), a higher rate of A and B final course grades (53.1% vs. 34.9%), a lower rate of D and F final course grades (13.6% vs. 39.4%). Data suggests what when students are classified on the basis of ACT quartile scores, those who participated in the SI sessions receive a considerably higher grade in Chemistry 109 that those who did not if they had higher ACT scores (top quartile: SI, 3.18 vs. 2.53 non-SI; middle two quartiles: 2.60 vs. 2.04; bottom quartile: 1.97 vs. 1.68).

Kemmet, L. C., & Mizeur, L. M. (2003). *Supplemental Instruction: Students helping students*. Unpublished manuscript. North Dakota State University. Available from the author: Linda M Mizeur, Department of Chemistry, North Dakota State University, 1025 16th St. N., Fargo, ND 58102, Lindell.Kemmel@ndsu.nodak.edu
Supplemental Instruction (SI) was used at North Dakota State University in the chemistry department and targets five courses: Conceptual Chemistry, General Chemistry I and II, and Organic Chemistry I and II with positive academic achievement for SI participants.

Kenney, P. A. (Writer). (1988). Supplemental Instruction sessions in math courses [Videotape]. In M. Garland (Producer). Kansas City, MO: Center for Supplemental Instruction, University of Missouri-Kansas City
This video tape features Dr. Patricia Kenney discussing ways in which Supplemental Instruction (SI) in mathematics courses differ from those in other content areas. Kenney served as a math SI leader during her doctoral research on the effectiveness of SI in math sessions at the University of Texas at Austin.

Kenney, P. A. (1989). Effects of Supplemental Instruction (SI) on student performance in a college-level mathematics course [Dissertation, The University of Texas at Austin, 1988]. *Dissertation Abstracts International, 50*(02), 378A.

This doctoral dissertation describes a research study that used Supplemental Instruction (SI) in a first-semester calculus course for business and economics majors at the University of Texas at Austin. The experimental design for this study used Campbell and Stanley's Nonequivalent Control Group model. The study used two lecture classes with the same instructor. Each class was divided into two discussion sections, and of those, one from each received the SI treatment. In the control sections the teaching assistant performed typical duties. In the SI sections the assistant performed the same duties but in addition she provided instruction on the study skills relevant to the course as it progressed and other activities that SI leaders would perform or facilitate. The results showed a statistically significant difference favoring the SI treatment group: the control group mean course grade point average of 2.43 and that for the treatment group of 3.00; the control group mean semester grade point average (GPA) of 2.51 and that for the treatment group GPA of 2.95. A multiple linear regression model was then chosen as a more complete method of analysis. Three of the independent variables had coefficients which were significant at the .05 level -- high school class rank, discussion section attendance, and control/treatment group membership. This helps to answer the question of whether SI was just a form of "double exposure" to the course content. Since SI sessions were qualitatively different than the traditional discussion sections (as evaluated by outside observers using a observation protocol) and that the students who participated in the SI sessions earned higher mean final course grades, it appears that SI sessions were more than double exposure. A multiple regression analysis of semester grade point average found that three of the variables were significant at the .05 level -- the SAT Mathematical score, discussion section attendance, and group membership. Controlling for exposure, it was suggested that these gains were due to the benefits of SI, not to the increased exposure of the group to course material. To investigate any residual effects from the SI program, the students from the initial study were tracked for an additional semester. Results from the follow-up study showed that students who had experienced SI had a pattern of fewer F grades in and withdrawals from the second-semester business calculus course. Of the 26 students who failed or withdrew from the original calculus course, former SI participants were more likely to immediately reenroll in the course (six students) than the non-SI participants (one student). Another study focused on the academic performance of SI and non-SI participants in a succeeding academic term in courses where SI was not offered. Former SI participants earned no F grades or withdrew from the second-semester business calculus course. The former SI participants earned a slightly higher mean final course grade (2.63 vs. 2.48), though it was not a statistically significant difference. The researcher speculates that the absence of SI with the second calculus course may had a bigger impact on former SI participants -- narrowing the positive difference in academic achievement with the control group -- since a support service which they were used to accessing was not available in the next course in the sequence.

Kenney, P. A. (1989). *Effects of Supplemental Instruction on student performance in a college-level mathematics course*. Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco, CA. Retrieved from ERIC database. (ED347874).

This paper describes a research study that used Supplemental Instruction (SI) in a first-semester calculus course for business and economics majors at the University of Texas at Austin. The experimental design for this study used Campbell and Stanley's Nonequivalent Control Group model. The study used two lecture classes with the same instructor. Each class was divided into two discussion sections, and of those, one from each received the SI treatment. In the control sections the teaching assistant performed typical duties. In the SI sections the assistant performed the same duties but in addition she provided instruction on the study skills relevant to the course as it progressed and other activities that SI leaders would perform or facilitate. The results showed a statistically significant difference favoring the SI treatment group: the control group mean course grade point average of 2.43 and that for the treatment group of 3.00; the control group mean semester grade point average (GPA) of 2.51 and that for the treatment group GPA of 2.95. A multiple linear regression model was then chosen as a more complete method of analysis. Three of the independent variables had coefficients which were significant at the .05 level -- high school class rank, discussion section attendance, and control/treatment group membership. This helps to answer the question of whether SI was just a form of "double exposure" to the course content. Since SI sessions were qualitatively different than the traditional discussion sections (as evaluated by outside observers using a observation protocol) and that the students who participated in the SI sessions earned higher mean final course grades, it appears that SI sessions were more than double exposure. A multiple regression analysis of semester grade point average found that three of the variables were significant at the .05 level -- the SAT Mathematical score, discussion section attendance, and group membership.

Kenney, P. A. (1990). *Effects of Supplemental Instruction on student performance in a college-level mathematics course: A report of additional results*. Unpublished manuscript. Annual Meeting of the American Educational Research Association. Boston, MA.
This paper details additional results from an experiment on the effects of Supplemental Instruction (SI) on student performance in a college business calculus course. The paper is a continuation of research first reported at the 1989 AERA Annual Meeting. SI participants who withdrew from the course most often cited their perceived lack of prerequisite skills or to problems with calculus concepts. The author postulates that the exposure to SI raised their awareness of their lack of skills. Non-SI participants who withdrew from the course most often cited "personal" reasons. Of the 26 students who failed or withdrew from the original calculus course, former SI participants were more likely to immediately reenroll in the course (six students) than the non-SI participants (one student). Another study focused on the academic performance of SI and non-SI participants in a succeeding academic term in courses where SI was not offered. Former SI participants earned no F grades or withdrew from the second-semester business calculus course. The former SI participants earned a slightly higher mean final course grade (2.63 vs. 2.48), though it was not a statistically significant difference. The author speculates that the absence of SI with the second calculus course may had a bigger impact on former SI participants -- narrowing the positive difference in academic

achievement with the control group -- since a support service which they were used to accessing was not available in the next course in the sequence.

Kenney, P. A. (1990). *Suggestions for mathematics Supplemental Instruction sessions*. Unpublished manuscript. Pennsylvania State University at College Park. College Park, PA.
This paper was developed to accompany a videotape that provides suggestions for strategies to use during Supplemental Instruction (SI) sessions. These suggestions are based upon direct experience while serving as a SI leader in a calculus course at the University of Texas at Austin while she was completing here Ph.D. on the effectiveness of SI. Some of the suggestions included: constantly referring to the course syllabus throughout the academic term; discussing effective note taking in math classes by the SI leader sharing their strategy; discussing ways to maximize the usefulness of the textbook; providing additional structure to the SI sessions; focuses on the problem-solving protocols rather than on just finding correct answers; SI leader providing worksheets to guide SI sessions that help generate group discussion, focus on key concepts, help review for exams, and practice problem-solving skills; test question prediction; and taking practice exams to prepare for in class examinations.

Kenney, P. A. (1997). *Supplemental Instruction in mathematics: Needs and approaches, critical aspects of mathematics training and the role of SI*. Unpublished manuscript. Pennsylvania State University at College Park. College Park, PA.
Mathematics presents a challenge to many students in higher education. This paper describes some of these challenges and two approaches to Supplemental Instruction (SI) that may help students. Critical components of math SI sessions: 1) a welcome period during which the glossary terms and protocols are discussed; 2) a period during which students use the protocols to solve problems similar to the homework; and 3) a period during which students may attempt some homework problems.

Kenney, P. A., & Kallison, J. M. (1992). *Learning to study college-level mathematics: Effects of a Supplemental Instruction (SI) program in first-semester calculus courses.* Conference Proceedings of the American Educational Research Association 1992 Annual Conference, San Francisco, CA.
This paper details results from a Supplemental Instruction program designed for students in college-level calculus courses during Fall 1989. The studies were conducted at the University of Texas at Austin by two teaching assistants employed by the mathematics department and were selected and trained by the SI program by the staff of the University's Learning Skills Center. The first study compared the performance of students in Business Calculus. While SI was beneficial to all SI participants (2.39 vs. 1.96 for non-SI participants), it was especially helpful for lower-ability students. The second study focused on an Engineering Calculus course. While the difference was closer for the two groups (2.01 vs. 1.91 for non-SI participants), SI provided disproportionate help to the lower-ability students as measured by SAT quantitative scores. More than 70 percent of students felt that the study strategies introduced by the SI leaders were either "very helpful" or "helpful." Almost 80 percent indicated that exposure to study strategies for calculus changed the way they studied

either "very much" or "somewhat," and that the techniques that these skills would help them in future courses either "very much" or "somewhat." More than 80 percent of the students responded that it was either "very important" or "important" that all SI leaders incorporate study strategies into discussion sections. SI leaders mentioned the positive impact of the SI program on themselves as well: reflect about their teaching methods; develop new teaching methods; and learned how to integrate learning strategies with content instruction.

Kenney, P. A., & Kallison, J. M. (1994). *Research studies of the effectiveness of Supplemental Instruction in mathematics*. New Directions for Teaching and Learning No. 60. San Francisco, CA: Jossey-Bass, Inc.
Given the emphasis on the need to succeed in college-level mathematics courses, these authors take a careful look at the effects of Supplemental Instruction participation on student performance. In addition to reviewing other research studies, this chapter focuses on the use of SI in Fall 1989 at the University of Texas at Austin in Calculus for Business Students and Calculus for Engineering and Natural Science Students. This paper describes a research study that used Supplemental Instruction (SI) in a first-semester calculus course for business and economics majors at the University of Texas at Austin. The experimental design for this study used Campbell and Stanley's Nonequivalent Control Group model. The study used two lecture classes with the same instructor. Each class was divided into two discussion sections, and of those, one from each received the SI treatment. In the control sections the teaching assistant performed typical duties. In the SI sections the assistant performed the same duties but in addition she provided instruction on the study skills relevant to the course as it progressed and other activities that SI leaders would perform or facilitate. The results showed a statistically significant difference favoring the SI treatment group: the control group mean course grade point average of 2.43 and that for the treatment group of 3.00; the control group mean semester grade point average (GPA) of 2.51 and that for the treatment group GPA of 2.95. A multiple linear regression model was then chosen as a more complete method of analysis. Three of the independent variables had coefficients which were significant at the .05 level -- high school class rank, discussion section attendance, and control/treatment group membership. This helps to answer the question of whether SI was just a form of "double exposure" to the course content. Since SI sessions were qualitatively different than the traditional discussion sections (as evaluated by outside observers using a observation protocol) and that the students who participated in the SI sessions earned higher mean final course grades, it appears that SI sessions were more than double exposure. A multiple regression analysis of semester grade point average found that three of the variables were significant at the .05 level -- the SAT Mathematical score, discussion section attendance, and group membership. Additional studies were conducted concerning SI. The first study compared the performance of students in Business Calculus. While SI was beneficial to all SI participants (2.39 vs. 1.96 for non-SI participants), it was especially helpful for lower-ability students. The second study focused on an Engineering Calculus course. While the difference was closer for the two groups (2.01 vs. 1.91 for non-SI participants), SI provided disproportionate help to the lower-ability students as measured by SAT quantitative scores.

Kernick, G., Kedian, J., Seneque, M., & Louw, R. (1993, 1993, December). *Supplemental Instruction: Toward a conceptual framework.* Conference.
Many academic leaders at postsecondary institutions in South Africa report that many students lack the necessary skills to become successful autonomous learners. Supplemental Instruction (SI) is being used to help students develop these skills outside of class since the traditional passive lecture-based educational delivery system will be slow to change. SI is differentiated from traditional tutorial sessions since in SI it is learner-controlled.

Kibble, J. D. (2009). A peer-led supplemental tutorial project for medical physiology: Implementation in a large class. *Advances in Physiology Education, 33*(2), 111-114.
The purpose of this study was to evaluate the practicality of implementing a peer-teaching program in a large class (_350 students) of medical students and whether such a program is beneficial. Case-based problems were developed by faculty members to facilitate student problem solving and discussion. Voluntary student enrollment was available during the first week of a semester. Tutorials took place during out of class time and were facilitated by peers from the previous class. Tutors were selected for their outstanding performance in physiology; they were provided with training in facilitation skills and were given a package of model answers. Sixty-eight students enrolled in this pilot program and were organized into groups of _8 students. On average, students attended four of six tutorials. Posttutorial quiz scores were significantly greater than paired pretest scores. Surveys showed that students had high expectations at the outset, which were matched with positive perceptions at the end of the tutorial program; the use of near-peer tutors was especially well received. Tutors also gave high approval ratings for their experiences. In conclusion, the peer tutoring program was logistically straightforward to implement in a large class and was endorsed by the participants.

Kimmins, L. R. (2014). Meet-up for success: The story of a peer led program's journey. *Journal of Peer Learning, 6*(1), 103-117. Retrieved from: http://ro.uow.edu.au/aipl/vol6/iss1/9.
Technological advancements have forced space and time to evolve to present a virtual university that allows increasing numbers of students to study from a university rather than at university. This study examined the impact of a version of Supplemental Instruction (SI) with students. The best people to guide and advise students through their university journey are experienced students. As Longfellow, May, Burke, and Marks-Maran (2008, p. 95) put it, teachers may be content or subject experts, but current “students are experts at being students.” Studies by Falchikov (2001) found that student leaders provide “expert scaffolding” that steps students from one level of learning to the next within the discipline area. Peer-assisted programs contribute to the development of a caring learning community as their trained leaders scaffold learning and negotiation between lecturer and student, both of which are desirable for student success and sustainable learning practices. Peer-assisted programs also provide a body of students with leadership qualities. This paper briefly explores the history and evolution of an on-campus peer led program to one that is embracing technology and

online modes of peer learning. The program's endurance hints at excellence and its dynamic nature is founded on innovation. Peer led programs have been found to benefit student leaders as much as the students who attend the sessions. Recent research on student leadership is uncovering the benefits to universities, as well as to individual students, of creating a pool of student leaders who can be retained after graduation as quality lecturers and tutors. It also produces graduates who possess the leadership skills prized by employers. Engagement with leadership activities such as those provided by peer led academic programs is a means of benefitting all participating students. This area is under-researched at this point. It is an area that needs further exploration and extension.

King, P. (1992). Kingston University: A British supervisor's Supplemental Instruction experience. *Supplemental Instruction Update*, 1, 3.
This newsletter article describes the use of Supplemental Instruction (SI) at Kingston University in London, UK. The author describes the use of the Assistant SI supervisor to help supervise an expanding SI program. The need for all SI leaders to attend frequent update training sessions is urged with the entire group meeting at the beginning of the meeting and then breaking into smaller groups based on academic disciplines for the remainder of the time.

King, P. (1994). *Supervision of Supplemental Instruction leaders: A practical guide*. Birmingham, England: Staff and Educational Development Association.
This chapter describes the Supplemental Instruction supervision system at Kingston University in the United Kingdom. Common issues mentioned by SI leaders included: SI session difficulties; SI session leadership skills; strategies to build SI attendance; and SI leader morale.

King, P. (1994). *Supplemental Instruction as a staff development model*. Birmingham, England: Staff and Educational Development Association.
This article describes the partnership between the faculty development unit at Kingston University (United Kingdom) and a member of the instructional faculty (professional full-time tutor who also delivered lectures to the students) as they used Supplemental Instruction for student enrichment and staff development. Several courses were targeted in the School of Surveying: Quantity Surveying and Urban Estate Management and European Estate Management studies. The tutor adopted several SI session activities to use during times that were traditionally conducted in a tutorial format. Behavioral changes in students included: students took initiative in sessions for selecting and discussing topics; students worked with each other to identify additional information; students asked more challenging questions of the tutor in class; and students looked to each other for support when challenged with academic matters.

Kirkham, R., & Ringelstein, D. (2008). Student Peer Assisted Mentoring (SPAM): A conceptual framework. *e-Journal of Business Education & Scholarship of Teaching, 2*(2), 39-49.
This paper presents a conceptual framework for the Student Peer Assisted Mentoring (SPAM) program and describes the theories that support it. SPAM is an adaptation of

Supplemental Instruction (SI). SPAM was first piloted in an accounting course in Australia. Three categories of SPAM sessions are held each academic term for the students: more formal session in which the academic lecturer for the course reviews and explains the the issues and problem solving techniques related to curent class topic. The second category of SPAM is a less formal session when the SPAM mentors work with the students in the class in a cooperative fashion to discuss the academic content. The third category of SPAM sessions are those that are formed by students in the class without the help of the SPAM mentors. Students take responsibility for these groups and develop more skills as a result. In addition to the academic benefit to the participating students, the SPAM Mentors also benefit: their own learning improves due to reworking the material a second time; and develop communication skills, leadership skills, and learning how to deal with the dynamics of managing a group.

Klein, D. (1990, 1990, January 16). Program lets students teach class: Volunteers from biology classes are taught how to think, *Daily Kent Stater Newspaper,* p. 8.
This newspaper article provides an overview of the Supplemental Instruction (SI) program at Kent State University (OH). Lowell Orr and LaVerne White from the biology department reported that SI participants earned higher mean final course grades in two courses: "Cells and Systems" and "Strategies for Survival in the Biological World." Students with high attendance patterns (10 or more times per term) generally receive a final course grade one full letter grade higher than non-SI participants.

Knich, D. (2006, 2006, July 13). USC's goal is a good year in first year, *The Post and Courier,* p. A 1.
This newspaper article describes how the Supplemental Instruction (SI) program has been implemented at the University of South Carolina in Columbia. The director of the SI program is interviewed and provides an overview of the development of the SI program at USC.

Knott, A. (1997). *Towards developing a theoretical and institutionally contextualised model of Supplemental Instruction in the curriculum which entails greater intra- and inter-institutional collaboration between Supplemental Instruction supervisors and academic development practitioners in the region.* Conference Proceedings of the South African Association for Academic Development Conference, Alpha Training Centre, Broederstroom, North West Province, South Africa.
This paper critically discusses the model of Supplemental Instruction (SI), an academic student assistance program that has been implemented on the Port Elizabeth campus of Vista University within the context of offering suggestions on how SI can be used by academic development (curriculum and institutional development). SI is one part of a comprehensive learning environment that promotes alternative teaching and learning methodologies and delivery systems that are relevant to the diverse needs of all students.

Koch, E. (1996). *The relationship of attendance of Supplemental Instruction with the performance of first year students at the University of Port Elizabeth.* Conference

Proceedings of the Conference on Student Contributions to Learning, Rhodes University, Grahamstown, Republic of South Africa.
The use of Supplemental Instruction (SI) at The University of Port Elizabeth (South Africa) was investigated by examining the statistical relationship of attendance of SI with performance through multiple regression analysis. The sample consisted of first year students in the Science and Humanities faculties. In most of the courses there was a positive relationship between attendance of SI and performance. This was especially true for students who attended five or more times.

Koch, E. (1997). *Lecturing between hope and despair: Lecturers' perceptions of academic development needs of students and lecturers at the University of Port Elizabeth.* Unpublished manuscript. University of Port Elizabeth, Centre for Academic and Organizational Development. Port Elizabeth, Republic of South Africa.
This report assessed the perceptions of lecturers of the success of academic development at the University of Port Elizabeth in the Republic of South Africa. The problem which emerged from the discussions was the growing number of underprepared and unprepared students who desire to attend tertiary education. Supplemental Instruction (SI) is regarded as a good program, but lecturers do not think that it reaches the targeted group of student effectively and deals adequately with the underlying problems. Since SI is voluntary, not all students who should come do so. Additionally, lecturers believe an increase in the structure of SI sessions may raise academic performance of the underprepared students who they believe need this. Additional solutions offered by the lecturers include: extended curriculum to provide more time-on-task; alternative learning methods by inclusion inside the class the use of collaborative learning, computerized self-paced instruction, and other methods.

Koch, E., & Mallon, P. (1998). Evaluation of Supplemental Instruction: A performance assessment approach. *South African Journal of Higher Education, 12*(3), 173-178.
This article about the use of Supplemental Instruction (SI) was originally presented at the South African Association for Academic Development Conference in Bloemfontein, Republic of South Africa. This research investigation assesses the performance of the SI program in terms of efficiency, quality, and effectiveness. Three concern areas were identified: voluntary attendance in SI sessions, unstructured approach in science courses, and ineffectiveness in increasing the pass rate of very under-prepared students. Key factors associated with positive program outcomes included: skill and ability of the SI leader with both facilitation but also knowledge/enthusiasm for the subject; involvement and support of the course lecturer; type of work covered in SI sessions; training both initially and ongoing of SI leaders; and more structure in SI sessions in science and other problem-solving areas.

Kochenour, E., & Roach, K. (1999). *SI: An effective program within student affairs.* Conference Proceedings of the First National Conference on Supplemental Instruction and Video-based Supplemental Instruction, Kansas City, MO.
This article is based on one previously published in the November/December 1997 issue of the *Journal of College Student Development, 38*(6), 577-586. The article contains a study from the University of Utah that examined the effectiveness of SI with

nearly 12,000 students enrolled in 82 classes. Among the findings: average grade of participating students was 0.603 higher than nonparticipants; percentage of attendance in SI decreased as class size increased; cost of SI was $4.00 per contact hour which does not include administrative overhead and was less expensive as compared to other forms of academic assistance offered to students such as tutoring.

Kochenour, E. O., Jolley, D. S., Kaup, J. G., Patrick, D. L., Roach, K. D., & Wenzler, L. A. (1997). Supplemental Instruction: An effective component of student affairs programming. *Journal of College Student Development, 38*(6), 577-586. Retrieved from http://lep.utah.edu/supplemental/article.php.
The effectiveness of Supplemental Instruction (SI) was examined using 11,000 participants enrolled in eight courses at the University of Utah, a large research university. Correlational analyses and analysis of covariance support the hypothesis that SI is an effective program. The data was collected between Autumn 1992 and Spring 1994. Students on average attended about 3.7 times for each academic quarter. There was a positive correlation between higher grades and higher levels of attendance in SI: zero, 2.387; 1 to 2, 2.597; and 3 or more times, 2.848. Though students of various previous levels of academic achievement attended SI in similar patterns, research suggests that SI sessions had the most impact on students with lower previous grade point averages. Additional analysis examined the interaction of SI performance and class size, PGPA and other variables. An unusual finding was that the percent of SI attendance decreased with increasing class size.

Koehler, C. (1995). Supplemental Instruction and critical thinking. *Supplemental Instruction Update*, 1, 3.
This article by an assistant professor of Communication Studies at the University of Missouri-Kansas City describes the utility of Supplemental Instruction (SI) for developing the critical thinking skills of SI participants. SI sessions involve a natural environment for inquiry by a community of learners. The SI leader helps participants to develop independent thinking. As students become engaged and active participants in the intellectual discourse that occurs during SI session, students move to higher levels of thought.

Kotze, G. S. (1994). *Essentials of a program for Supplemental Instruction as academic support for technikon students in mathematics courses at entry-level.* (Ph.D. dissertation), Faculty of Education (Department of Diadactics) at the University of the Orange Free State, Bloemfontein, Republic of South Africa.
This Doctor of Philosophy dissertation is focused on the effectiveness of Supplemental Instruction (SI) with postsecondary students in entry-level mathematics courses at an institution in the Republic of South Africa. The SI model was evaluated regarding its effectiveness with providing the necessary psychological, philosophical, educational, and sociological components that can contribute towards successful mathematics mastery. Through qualitative and quantitative evaluations, the SI model was found to support increased academic achievement and mastery of mathematical concepts.

Kowal, P., & Shaw, G. (1998). Academic support: The bridge and catalyst for academic success and student development. In P. L. Dwinell & J. L. Higbee (Eds.), *Developmental education: Meeting diverse student needs* (pp. 29-34). Morrow, GA: National Association for Developmental Education
Many learning support professionals consider themselves developmental educators. The process of facilitating the academic growth of students is grounded in developmental theory. This chapter discusses how academic assistance programs such as Supplemental Instruction, tutor training, freshman experience programs and collaborative efforts promote the cognitive and personal development of participating students.

Kreke, P. J., & Gibbon, T. C. (2003). *Organic chemistry and Supplemental Instruction*. Unpublished manuscript. Mount St. Mary's College. Maryland. Available from the authors: Patricia Kreke, Science Department, Mount St. Mary's College, Emmitsburg, MC 21727, kreke@msmary.edu, gibbon@msmary.edu
Supplemental Instruction (SI) is used at Mount St. Mary's College (MD), a small liberal arts college, in an organic chemistry course. Qualitative and quantitative research studies have found benefits of the SI program for SI participants, SI leaders, and the faculty members who host SI in their course.

Langan, M. B. (1999). *The effect of Supplemental Instruction on the grades of college students.* (Master's of Arts thesis), University of Detroit Mercy, Detroit, MI.
This study of Supplemental Instruction at the University of Detroit Mercy focused on conditionally admitted students in the University College Program during 1997 concerning their grade point average. These students were enrolled in one or more of the following courses: Principles of Human Anatomy, Principles of Chemistry II, General Chemistry I, Elementary Algebra, College Algebra, Mathematical Analysis I, and Elementary Functions. SI attendance was broken into four categories: 0-25%, 26-50%, 51-75%, and 76-100%. While SI attendance was statistically significant in relation to higher final course grade, there was not a perfect corresponding relationship with increasing rates of SI attendance: 0-25%, 1.83 GPA; 26-50%, 2.07; 51-75%, 1.83; and 76-100%, 2.37.

Lapish, K. K. (2002). *An assessment of the Supplemental Instruction program of the academic support center at Clemson University.* (Master's of Arts thesis), Clemson University, Clemson, SC.

Latino, J. A., & Unite, C. M. (2012) *New Directions for Higher Education* (Vol. 157). San Francisco, CA: Wiley Periodicals
Several pages of this book chapter were devoted to an overview of the SI model.

Lazari, A., & Simons, K. (2003). Teaching college algebra using Supplemental Instruction versus the traditional lecture method. *Georgia Journal of Science, 61*(4), 192-198.
This article describes the use of Supplemental Instruction (SI) at Valdosta State University with a college algebra course. Students with predicted weaker entry level

math skills, as measured by the SAT, who participate in SI will achieve similar final course grades with students who have average math skills. More often students with weaker entry math skills chose to voluntarily participate in SI sessions.

Lee, R. C. (1998, 1998, June 16). UTA offering help with tough courses: Supplemental Instruction boosts grades, officials and students say, *Fort Worth Star-Telegram,* p. 1. This newspaper article describes the use of Supplemental Instruction (SI) at the University of Texas-Arlington. The article contains interviews with school officials and students about the SI program.

Legge, K. P. C. (2010). *Does mandatory Supplemental Instruction work in development math education? A study of students enrolled in developmental math courses at a suburban community college in the northeast.* (Ed.D. dissertation), Temple University. The number of students entering the community college in need of developmental math has not changed, remaining at a steady 60% over the past seven years. This study compared the success rate of Mandatory Supplemental Instruction (MSI) sessions within four sections of a developmental math course compared with the success rates of students enrolled in both the Traditional Classroom setting and the Individualized format at Suburban Community College (SCC) during the Fall 2009 semester. These MSI format courses were compared with both the Individualized format of MAT 060 and the Traditional Classroom format of the same course. The students included in these sections were a combination of students who were: 1) suggested by advisors to enroll in this developmental math course after receiving a low score on the college's Accuplacer placement test for algebra or continuing the progression of developmental math from the lower level arithmetic class; 2) mandated to attend MSI after successful completion of the Jump Start Math Program, or 3) self-selected into the MSI group anticipating the need for additional help in the course. The two primary data sets available for this study are student math final grades and student participation/attendance records. Secondary sets of data include informal focus group notes, final exam scores, student attendance records for both class lectures and MSI sessions, and Supplemental Instruction Leader anecdotal records. The findings of this study conclude that success rates of students enrolled in the MSI sections of developmental math do not differ significantly from those enrolled in the Traditional Classroom format of developmental math; however, both groups did differ significantly from the Individualized format of developmental math, in that the students enrolled in the Individualized format succeeded at a lesser rate and withdrew at a greater rate than their MSI or Traditional Classroom counterparts. This study also concluded that female, full-time students succeeded at a greater rate across the board, which is consistent with the literature. These findings were significant for a number of reasons. Although the difference between the treatment group and the Traditional Classroom group was not significant, there are a variety of reasons at the program level as to why this may have been so and there are many future constructs that SCC can put in place to strengthen and reassess the MSI program. Although this study was focused on the MSI treatment, the data revealed a greater issue existing in the Individualized format of developmental math at SCC. Future considerations can be made in this particular delivery method to improve success rates of students involved in this program. Future research on MSI in the form of persistence and retention rates,

graduation rates, transfer rates, subsequent math course grades and success in other college-level classes can be explored to provide the MSI program with more data to determine if particular groups of students are benefiting from this format.

Levine, P. (1975, 1975, November 13). 'Whiz-Kids' and troubled flock to learning center, *UNews (University of Missouri-Kansas City Student Newspaper),* pp. 1, 13.
This newspaper article describes the use of Supplemental Instruction (SI) with some of the most gifted students at the University of Missouri-Kansas City. Skills that these students used in high school are not sufficient for the academic rigor experienced at the university.

Levitz, R. (1990). Supplemental Instruction takes off. *Recruitment and Retention in Higher Education Newsletter, 4*(11), 7.
This newsletter article provides a short overview of the Supplemental Instruction (SI) program. George Russell, chancellor at UMKC was quoted, "The SI approach avoids both the remedial stigma of typical assistance programs and the high costs of one-on-one tutoring."

Levy, T. (1991, 1991, October 14). Students get into the upliftment business, *Business Day Newspaper,* p. 10.
This newspaper article describes the use of Supplemental Instruction (SI) at Wits University in South Africa. The SI program will be started by commerce students at the university. The SI program will be aimed at assisting Black students who have been disadvantaged by the secondary school system.

Lilley, L. L. (1997). Retention of racial-ethnic minority students within Virginia baccalaureate schools of nursing (nursing education) [Dissertation, George Mason University, 1997]. *Dissertation Abstracts International, 58*(07), 3559B.
The purpose of this dissertation research study was to examine the relationship between retention strategies and retention rates of racial-ethnic minority baccalaureate nursing students attending public universities and colleges within the State of Virginia. Tinto's Model of Student Departure was used as the framework for the study. A cross-sectional one-part mailed survey design was used for this study. A descriptive methodology was used to summarize and describe the data. Qualitative comments were also analyzed for themes about retention. Statistically significant findings included: lack of close tracking of retention of racial-ethnic minority students by the schools; no statistical significance between the variable of retention problems and the variables of tutoring for racial-ethnic minority students; and fewer than 37% of the schools had Supplemental Instruction or related programs available at the department or school level, although they may have been offered elsewhere on campus.

Lin, J.-L., & Woolston, D. C. (2008). *Important lessons in engineering education learned from seven years of experience in undergraduate academic support programs.* Conference Proceedings of the ASEE/IEEE Frontiers in Education Conference, Saratoga Springs, NY.

Supplemental Instruction (SI) was used in the College of Engineering at the University of Wisconsin-Madison. SI has been successfully implemented with Calculus, calculus-based introductory Physics, Statics, introductory dynamics courses. These courses serve as gatekeepers for the engineering degree programs. Previous to introducing SI, about a quarter of the students experienced academic difficulty in these courses. SI is listed as a formal course in the course timetable for zero credits. Enrollment in the SI course is optional. In gene4ral, SI students earn a higher or slightly higher average course grade as compared with nonparticipants. Fewer SI students have grades lower than C. SI participants leave engineering as a degree program at a rate of about 20% while the departure rate for the nonparticipants is nearly double, 37%.

Lipsky, S. A. (2001). Enhancing students' academic performance via Supplemental Instruction and linked courses. *The ACT 101 Journal, 8*(1), 3-6.
The Learning Center program at Indiana University of Pennsylvania is a comprehensive freshman-experience program providing academic support services to approximately 400 at-risk freshmen. Supplemental Instruction (SI) is an important component of this program to increase student academic achievement and persistence. Participating students earned a final course grade approximately half a letter grade higher than nonparticipants with nearly two-thirds of students participating in the SI program.

Lipsky, S. A. (2006). A credit-bearing course for training SI leaders. In M. E. Stone & G. Jacobs (Eds.), *Supplemental Instruction: New visions for empowering student learning* (pp. 33-42). New Directions for Teaching and Learning, No. 106. San Francisco: Jossey-Bass
This chapter describes key components in the design of a training counselor for Supplemental Instruction (SI) leaders. It looks at course topics and accompanying theoretical frameworks and explains how content is delivered.

Lipsky, S. A., & Kapadia, M. (2013). Effects of work experiences for academic peer educators. *Synergy, 6*, Article 3. Retrieved from http://www.myatp.org/wp-content/uploads/2013/05/Effects-of-Work-Experience.pdf.
This study employed a qualitative research model to understand the potential outcomes of the Supplemental Instruction (SI) program on the SI leaders. Thirteen experienced SI leaders participated in focus groups. The study was completed as part of the program's assessment and accountability system in addition to understanding a topic not often investigated in a rigorous fashion. The study revealed several findings: (1) intellectual growth (knowlege of subject matter, learning strategies, and higher-level cognition; (2) personal growth (listening, interpersonal communication, time management, leadership, and self-confidence; and (3) professional growth (work and career-related knowledge and self-efficacy). The SI leaders saw how these skills would be useful as they began their work careers. For SI leaders who had considered a career in education, the experience of serving with the program had solidified their decision. Some SI leaders now were considering a decision or change from previous interests for a career in teaching.

Livingston, S., Duda, D., & Lucas, K. (2000). *Supplemental Instruction at LaGuardia Community College.* Conference Proceedings of the PEPnet 2000 Innovation in Education: Postsecondary Education Programs Network Annual Conference, Denver, CO.
The Supplemental Instruction (SI) program at LaGuardia Community College (NY) has been expanded and adapted to serve students who are deaf and hard-of-hearing. Too often interpreters have been expected to serve the role of tutor with the advantage of specific training. In the LaGuardia model, the interpreter is trained to provide services as interpreter as well as SI leader. Some of the adaptations of the SI model include the following. The interpreter also takes as many notes as possible while they are interpreting the lectures. This allows them to provide some model note taking for the hearing impaired students to consider for adoption. "Text interpretation" is another strategy of the hybrid SI leader. In this activity key passages from the textbook or other print resources are made into transparencies and projected during the SI session. This activity is used for vocabulary development of key terms and support improved reading comprehension. At the beginning of the academic term all the hearing impaired students are encouraged to enroll in the same section of the core curriculum course that is supported by the hybrid SI leader. Results suggest that SI participants earn higher final course grades.

Lockie, N. M., & Van Lanen, R. J. (1991). Utilizing Supplemental Instruction to enhance student performance in a freshman level chemistry course. *Transactions of the Illinois State Academy of Science, 84*(10), 10.
This abstract describes the use of Supplemental Instruction (SI) with entry-level chemistry students at Saint Xavier University (Chicago, IL).

Lockie, N. M., & Van Lanen, R. J. (1992). Supplemental Instruction in Chemistry: A collaborative relationship among students, faculty, and a peer facilitator. *Illinois Association for Personalized Programs Newsletter, 1*, 3-4.
This newsletter article describes the use of Supplemental Instruction (SI) at Saint Xavier College (Chicago, IL) in chemistry courses. Data from a 1990-91 study with a Chemistry 108 course suggests that SI participants earn higher mean final course grades and receive lower rates of D, F and withdrawals (15.4% vs. 37.1%) than non-SI participants.

Lockie, N. M., & Van Lanen, R. J. (1994). Supplemental Instruction for college chemistry courses. In D. C. Martin & D. Arendale (Eds.), *Supplemental Instruction: Increasing achievement and retention* (pp. 63-74). New Directions for Teaching and Learning No. 60. San Francisco, CA: Jossey-Bass, Inc.
Strategies for maximizing the effectiveness of Supplemental Instruction in college chemistry courses are presented. The authors share lessons from use of SI in Principles of Inorganic Chemistry, Principles of Organic Chemistry and Biochemistry, General Chemistry 1, and Organic Chemistry I and II at Saint Xavier University (Chicago, IL). Some of the SI session strategies include: problem-solving strategies; review of basic chemistry content; accurate use of chemical language; collaborative

learning activities that promote active learning by all SI session participants; quizzes to provide comprehension checkpoints; and sharing study strategies with each other.

Lockie, N. M., & Van Lanen, R. J. (1997, 1997). *Nursing students' success and retention in chemistry courses: A collaborative approach.* Conference Proceedings of the 1997 International Nursing Research Congress Abstracts, Vancouver, Canada.
This article describes the use of Supplemental Instruction (SI) with improving academic performance of nursing students in chemistry courses. The authors used the SI program at Saint Xavier University in Chicago, IL.

Lockie, N. M., & Van Lanen, R. J. (2008). Impact of the Supplemental Instruction experience on science SI leaders. *Journal of Developmental Education, 31*(3), 2-4, 6, 8, -12, 14.
This article reports on a qualitative study describing the experiences of Supplemental Instruction (SI) leaders in science courses at Saint Xavier University (Chicago, IL). Themes that emerged from this analysis for the SI leaders included: (a) greater appreciation of the diversity of student learning styles; (b) increased understanding of the subject matter; (c) greater self-confidence as learners; (d) development of closer relationships with faculty members; (e) application of the strategies and skills learned as an SI leader in other courses, and (f) realization of the importance and values of collaborative learning.

Lockie, N. M., VanLanen, R. J., & McGannon, T. (2013). Educational implications of nursing students' learning styles, success in chemistry, and Supplemental Instruction participation on National Council Licensure Examination-Registered Nurses performance. *Journal of Professional Nursing, 29*(1), 49-58.
The purpose of this study was to examine the relationship between a number of demographic and academic variables of baccalaureate nursing graduates (n = 197) and their performance on the National Council Licensure Examination-Registered Nurses (NCLEX-RN). Variables examined in this study include gender, race, transfer status, Chemistry 108 grade, and student learning style and participation in supplemental instruction sessions. Variables found to be predictors of performance on the NCLEX-RN were Chemistry 108 grade, student learning style, and race. The results of this study can be used by nursing faculty to enhance nursing students' success on the NCLEX-RN. The use of these predictors will allow early identification of those students who are likely to have difficulty in passing the NCLEX-RN, thus providing adequate time and opportunities for appropriate interventions.

Loh, H. (1992). *Peer Assisted Study Sessions for LSB181, Anatomy for the Nursing Students, 1992*. Unpublished manuscript. Queensland University of Technology. Brisbane, Queensland, Australia.
This report discusses the use of Supplemental Instruction (SI), which is called Peer Assisted Study Sessions (PASS) at the local institution with nursing students enrolled in a anatomy course. Approximately half the students attended the SI sessions during the academic term. The program reduced the failure rate of students (7.8% vs. 19.1%),

increased the percent of students receiving high marks (5, 6 or 7 on a scale of 0-7), and improved the mode and mean final course grade.

Loh, H. (1993). *Peer Assisted Study Sessions in anatomy for nursing students.* Conference Proceedings of the Peer tutoring: Learning by teaching, Auckland, New Zealand.
This article describes the use of Peer Assisted Study Sessions (PASS), the local institutional name for their adaptation of the Supplemental Instruction (SI) model at Queensland University of Technology (Brisbane, Queensland, Australia). Following an institutional commitment to Total Quality Management (TQM), some TQM principles were found consistent with the SI model of academic achievement. An anatomy course with first year nursing students was selected as a pilot for the SI program. Program outcomes include the following for SI participants: reported an increase in their confidence with the course after participating in SI sessions (87%); reduced percent of students failing the course (7.8% vs. 19.3%); agreed that the SI leaders motivated them to work harder (80%); increased their learning skills (90%); increased their understanding of the content material (87%); and increased their ability to apply the knowledge gained from class lectures (82%). SI leaders reported the following benefits to them: developed leadership and character, improved their own learning and facilitating techniques, acquired skills in group management, developed presentation skills, and increased their own confidence and self esteem.

Loh, H. (1993). *Strategies to overcome the high failure rate in a subject.* Conference Proceedings of the 6th International Conference on the First Year Experience, Boston, MA.
The Queensland University of Technology (Brisbane, Australia) has investigated the applicability of Total Quality Management (TQM) for improving student academic success. An anatomy course for nursing students saw its failure rate drop from 22.8% to 13.6% after the introduction of several interventions, including Supplemental Instruction (SI). The local institutional name used is Peer Assisted Study Sessions (PASS). Course lecturers listed the following benefits of the program: rapid dissemination of information and instruction to students via the SI leaders; rapid feedback from students concerning course content; provided small group benefits in large lecture classes; improved and increased the amount of communications between students and the lecturer; and the lecturer was able to give students increased responsibility for the learning process. SI leaders mentioned the following benefits to themselves: developed leadership and character, improved their own learning and facilitating techniques, acquired skills in group management, developed presentation skills, and built their own confidence and esteem.

Loh, H. (1994). *Strategies to overcome the first year high failure rate in anatomy for nursing students.* Conference Proceedings of the 7th International Conference on the First-Year Experience, Dublin, Ireland.
This paper describes the use of Supplemental Instruction (SI) since 1992 with nursing students at the Queensland University of Technology (Australia) in an anatomy course (LSB 181). At QUT, SI is known as PASS (Peer Assisted Study Sessions). Data from

1992 through 1995 suggest substantial benefits of the SI program to students, SI leaders and the course instructor. The performance of the students were examined on a 3 to 7 scale (3=fail, 4=pass, 5=credit, 6=distinction, 7=high distinction). SI participant interviews and 1995 survey data suggested agreement with the following statements regarding the impact of SI: increased confidence levels (87.0%), lowered anxiety levels (61.5%), higher motivation to achieve grades of distinction (84.6%), and developed new study skills (70.3%). Based on data from 1992 in the anatomy course, the SI participants achieved significantly ($p < .01$) higher levels of academic achievement. In comparison with non-SI participants, there were more grades of level 6 or 7 (39% vs. 27%) and less grades of level 3 (10% vs. 25%). When comparing failure rates, the results favored the SI participants. SI participants in 1995 failed the class at a rate of 2.7% while the non-SI group failed the class at a higher rate of 13.3%. To investigate the possible impact of student motivation, the failure rate of students who desired to participate in SI but were unable to attend due to time conflicts failed at nearly the same rate (12.7%) as the entire non-SI group (13.3%). This appears to support the conclusion that student motivation was not the major variable impacting student academic performance. The overall class average (including all SI and non-SI participants) for grades of level 3 (failure) were reduced from 22.8% before the introduction of SI down to 7.1% after the fourth year of SI. SI leaders reported the following positive results: developed leadership skills; improved their facilitation skills; improved their study skills; acquired group management skills; and increased their own confidence and self esteem. Instructors who had SI attached to their course reported the following positive results: rapid dissemination of information and instructions to the SI participants; provided benefits of small group instruction within the large lecture sections (n = 400); instructors received feedback from students which allowed them to "fine-tune" teaching and improve teaching performance; involvement with the SI program provided new avenues for grants; enhancement of curriculum vitae; and improved positive attitude and sense of achievement since students improved academic performance.

Loh, H. (1996). *Supplemental Instruction: A peer collaborative learning program applied within anatomy for first year nursing students.* Conference Proceedings of the 2nd Pacific Rim Conference on the First Year in Higher Education, Melbourne, Queensland, Australia.
This paper describes the use of Supplemental Instruction (SI) since 1992 with nursing students at the Queensland University of Technology (Australia) in an anatomy course (LSB 181). At QUT, SI is known as PASS (Peer Assisted Study Sessions). Data from 1992 through 1995 suggest substantial benefits of the SI program to students, SI leaders and the course instructor. The performance of the students were examined on a 3 to 7 scale (3=fail, 4=pass, 5=credit, 6=distinction, 7=high distinction). SI participant interviews and 1995 survey data suggested agreement with the following statements regarding the impact of SI: increased confidence levels (87.0%), lowered anxiety levels (61.5%), higher motivation to achieve grades of distinction (84.6%), and developed new study skills (70.3%). Based on data from 1992 in the anatomy course, the SI participants achieved significantly ($p < .01$) higher levels of academic achievement. In comparison with non-SI participants, there were more grades of level 6 or 7 (39% vs.

27%) and less grades of level 3 (10% vs. 25%). When comparing failure rates, the results favored the SI participants. SI participants in 1995 failed the class at a rate of 2.7% while the non-SI group failed the class at a higher rate of 13.3%. To investigate the possible impact of student motivation, the failure rate of students who desired to participate in SI but were unable to attend due to time conflicts failed at nearly the same rate (12.7%) as the entire non-SI group (13.3%). This appears to support the conclusion that student motivation was not the major variable impacting student academic performance. The overall class average (including all SI and non-SI participants) for grades of level 3 (failure) were reduced from 22.8% before the introduction of SI down to 7.1% after the fourth year of SI. SI leaders reported the following positive results: developed leadership skills; improved their facilitation skills; improved their study skills; acquired group management skills; and increased their own confidence and self esteem. Instructors who had SI attached to their course reported the following positive results: rapid dissemination of information and instructions to the SI participants; provided benefits of small group instruction within the large lecture sections (n = 400); instructors received feedback from students which allowed them to "fine-tune" teaching and improve teaching performance; involvement with the SI program provided new avenues for grants; enhancement of curriculum vitae; and improved positive attitude and sense of achievement since students improved academic performance.

Loh, H. (1997). *Multidisciplinary peer collaborative study programs for first year Aboriginal and Torres Strait Islander students*. Unpublished manuscript. Queensland University of Technology at Brisbane. Queensland, Australia.
This report describes the use in 1995 of Supplemental Instruction (SI) at Queensland University of Technology (Australia) with first year Aboriginal and Torres Strait Islander (A&TSI) students. Many of these students began postsecondary education with high anxiety (79% student response), low to medium confidence in passing their courses, limited knowledge of study skills, and high to moderate difficulty levels within their respective subjects. A&TSI students had an attrition rate nearly double other students at QUT (32.7% vs. 18.4%). About half the A&TSI students participated in the SI program. Using a four point scale (greatly, moderately, slightly, not at all), data obtained from end of academic term student surveys of SI participants suggests that SI: was helpful for increased learning (70% of students selected "greatly"), lowered anxiety levels (45% greatly and 45% moderately), increased confidence levels (50% greatly, 50% moderately), improved enthusiasm and motivation to perform better (45% greatly, 45% moderately), and helped to create a favorable environment supporting learning (100% greatly). SI participant grades were evaluated on a seven point scale: fail, one to three; pass, 4; credit, 5; distinction, 6; high distinction, 7. When analyzing the grade distribution for all A&TSI students, 22.9% of SI participants earned grades of 6 or 7 as compared with 0% for the non-SI. When examining the failing grades (1, 2 or 3) the SI group had a dramatically lower rate (22.8%) when compared with the non-SI group (78.3%). SI leaders reported that their participation in the program led to the following outcomes: developed facilitation and group organizational skills; improved confidence and self esteem; and developed their own learning skills.

Loh, H., & Kelly, B. A. (1994). *Supplemental Instruction (SI) in anatomy for first year nursing students*. Unpublished manuscript. The Queensland University of Technology. Brisbane, Australia.
This paper describes the use of Supplemental Instruction (SI) since 1992 with nursing students at the Queensland University of Technology (Australia) in an anatomy course (LSB 181). At QUT, SI is known as PASS (Peer Assisted Study Sessions). The SI modeled was contextualized in several ways: two SI leaders facilitated each group, allowing for larger numbers to attend each SI session; principles of Total Quality Management were employed to use SI as a feedback loop between the students and the lecturer, thereby providing data to the instructor to allow for immediate changes in the content and delivery. Data from 1992 through 1995 suggest substantial benefits of the SI program to students, SI leaders and the course instructor. The performance of the students were examined on a 3 to 7 scale (3=fail, 4=pass, 5=credit, 6=distinction, 7=high distinction). SI participant interviews and 1995 survey data suggested agreement with the following statements regarding the impact of SI: increased confidence levels (87.0%), lowered anxiety levels (61.5%), higher motivation to achieve grades of distinction (84.6%), and developed new study skills (70.3%). Based on data from 1992 in the anatomy course, the SI participants achieved significantly ($p < .01$) higher levels of academic achievement. In comparison with non-SI participants, there were more grades of level 6 or 7 (39% vs. 27%) and less grades of level 3 (10% vs. 25%). When comparing failure rates, the results favored the SI participants. SI participants in 1995 failed the class at a rate of 2.7% while the non-SI group failed the class at a higher rate of 13.3%. To investigate the possible impact of student motivation, the failure rate of students who desired to participate in SI but were unable to attend due to time conflicts failed at nearly the same rate (12.7%) as the entire non-SI group (13.3%). This appears to support the conclusion that student motivation was not the major variable impacting student academic performance. The overall class average (including all SI and non-SI participants) for grades of level 3 (failure) were reduced from 22.8% before the introduction of SI down to 7.1% after the fourth year of SI. SI leaders reported the following positive results: developed leadership skills; improved their facilitation skills; improved their study skills; acquired group management skills; and increased their own confidence and self esteem. Instructors who had SI attached to their course reported the following positive results: rapid dissemination of information and instructions to the SI participants; provided benefits of small group instruction within the large lecture sections ($n = 400$); instructors received feedback from students which allowed them to "fine-tune" teaching and improve teaching performance; involvement with the SI program provided new avenues for grants; enhancement of curriculum vitae; and improved positive attitude and sense of achievement since students improved academic performance.

Love, T., Keinert, F., & Shelley, M. (2006). Web-based implementation of discrete mathematics. *Journal of STEM Education:P Innovations & Research, 7*(3), 25-35.
The Department of Mathematics at Iowa State University teaches a freshman-level Discrete Mathematics course with total enrollment of about 1,800 students per year. The traditional format includes large lectures, with about 150 students each, taught by faculty and temporary instructors in two class sessions per week and recitation sections,

with about 35 students each, taught once per week by a teaching assistant. In this format, the course experienced the standard academic problems associated with the multi-section large lecture format: over 30% D/F/Withdraw rates; lack of uniformity and inconsistency in course objectives, delivery, and testing; low student morale and performance; and insufficient individualized feedback from instructors. In addition, students failed to see the connection of the material to subsequent courses and real world problems; spent great effort on repetitive calculations and little or none on computing; lacked skills in analyzing problems, data presentation, and graphical analysis; and often had substantial gaps in basic algebra skills that were not addressed properly by course content. Discrete Mathematics was redesigned to address these challenges with a Web-based, self-paced model. The Web-based environment integrates WebCT as learning management software, MapleTA as an online testing program, and textbook and related materials by Barnett, Ziegler, and Byleen (Prentice-
1. Web-based Implementation of Discrete Mathematics Discrete Mathematics was redesigned as a Web-based, self-paced course. The content of the course is covered in several best-selling textbooks, all of which cover fairly similar topics. A course with the same role within the curriculum and with comparable enrollment numbers is taught at all large universities. Therefore, a redesign of Discrete Mathematics has wide applicability, and hence a substantial impact on mathematics learning in many colleges within Iowa State University and at public universities across the nation. Section 2 of this paper describes the traditional course components. Section 3 describes Hall) as the content basis. The redesigned course includes weekly small recitation sections, additional office hours, availability of the Math Help Room, and peer-mentoring through study groups and Supplemental Instruction. Integrated and proactive student support includes Web-based feedback through online office hours, a Web-bulletin board for each class, and Web-published individual current scores and class standing. The redesigned course syllabus is divided into manageable modules, with clearly communicated learning outcomes and objectives. Expansion of learning and understanding through the application of technology are achieved through incorporating Microsoft EXCEL spreadsheets for instantaneous graphics and simplification of extensive repetitive calculations. The Web environment also includes a new fourth main course topic of basic algebra skills early in the material as preparation for the other sections.Assessment of the course redesign was performed by the Research Institute for Studies in Education (RISE), in the College of Education, at Iowa State University. The general assessment strategy included a pretest- posttest control group design and longterm study of academic success. Student performance data were used to determine which differences in learning outcomes may be attributable to specific course components. Students in the Web-based sections performed no worse, and usually performed better, than did classroom-based students. These results are based on student performance on learning outcomes in Fall 2002, Spring 2003, and Fall 2003. In a straight comparison, the design sections did significantly better than the control sections on eleven out of thirteen exams compared, with comparable results on the remaining two exams. This difference exists despite significantly higher cumulative GPAs for students in the control sections for two semesters and insignificant differences in the third semester. This suggests that the Web-based course design is able to enhance the performance, and hence the chances for retention, of even less-highly

achieving students (as determined by their lower GPAs). A longer-term study of academic success has tracked students through subsequent courses for which Discrete Mathematics is a prerequisite. These results are also positive, though less conclusive. The traditional course used 12 faculty and 15 teaching assistants to deliver the course at a cost of $129 per student. The redesigned course is staffed with 3 faculty and 9 teaching assistants. The redesign costs $77 per student, resulting in savings of $93,600 per year. the goals of the course redesign and Section 4 describes the final course structure. Section 5 discusses the comparison of impact on students in the traditional and redesigned classes. Section 6 concerns the lessons learned from the course redesign. 2. Traditional Discrete Mathematics Course A course on discrete mathematics had played an important role at Iowa State University in its traditional format. This structure has both useful and concerning aspects that influenced the redesign.

Loviscek, A. L., & Cloutier, N. R. (1997). Supplemental Instruction and the enhancement of student performance in economics principles. *American Economist, 41*(2), 70-76.
The authors presented an empirical evaluation of Supplemental Instruction (SI) in an economics principles course at the University of Wisconsin-Parkside. Using a two-equation model and student transcript data readily available to instructors and academic researchers, the authors evaluated the effectiveness of the SI program in economics principles. The analysis explicitly considers the confounding factor of self-selection in program participation. They found that ordinary least squares significantly underestimates the positive impact of SI. The results suggest that formal programs designed to increase the intensity of instruction can have a demonstrable payoff in the form of increased student learning.

Loy, W., Crown, K., & Wessley, A. (1996). *Academic support service as a means for professional development*. Unpublished manuscript. St. Louis Community College at Meramec. St. Louis, MO.
This paper describes the use of Supplemental Instruction (SI) as serving both the purpose of providing academic support to students while providing a venue for faculty professional development. The authors presented the paper at the 1996 NISOD conference. During the process of instituting SI, faculty re-familiarize themselves with good student qualities. Faculty learn about collaboratively learning and study strategies that often can be incorporated into classroom. Faculty learn more about curriculum development and learning experiences. The instructor receives continual assessment and feedback through the SI program.

Lukoshus, W. (2003, 2003, August 17). More than 50 classes at South Lake sites, *The Post-Tribune Newspaper,* p. B6.
This newspaper article describes the use of Supplemental Instruction (SI) at the Indiana University-Purdue Calumet.

Lukoshus, W. (2004, 2004, December 31). 2004 a transformational year for Indiana University-Purdue Calumet, *The Post-Tribune Newspaper,* p. B2.
This newspaper article describes the use of Supplemental Instruction (SI) at the Indiana University-Purdue Calumet.

Lukoshus, W. (2004, 2004, April 23). New program helps freshmen, *The Post-Tribune Newspaper,* p. B2.
This newspaper article describes the use of Supplemental Instruction (SI) at the Indiana University-Purdue Calumet. Preliminary research studies suggest lower withdrawal rates and higher retention rates for SI participants.

Lundeberg, M. A. (1990). Supplemental Instruction in chemistry. *Journal of Research in Science Teaching, 27*(2), 145-155.
This two-year study (148 students) at the University of Wisconsin (River Falls, WI) was designed to measure some effects of Supplemental Instruction in General Organic and Biological chemistry courses. Goals of the SI program included: develop conceptual understandings; articulate both understandings and misconceptions in a think-aloud fashion; connect, relate, and integrate scientific information; develop confidence and ability in problem solving; and learn how to learn science. Some of the challenges with students are: motivating students to use problem-solving strategies; failure to accurately understand the problem before using a problem-solving strategy; attempt to use rote memory when solving; and failure to integrate new material with old. Quantitative studies suggested that SI contributed to higher mean final grades (2.80 vs. 2.26, $p < .002$) and lower rates of D, F and withdrawals for SI participants. Qualitative studies of SI participant comments suggested that SI was helpful in a variety of ways. In addition, SI leaders maintained journals. Six themes emerged from the journals: accommodating needs of diverse learners; understanding versus memorizing; depth versus breadth of discussion; relationships between ability, knowledge, and confidence; social relationships with students; and challenges to SI leaders' knowledge. The first three of these themes represent tensions that reoccurred several times over the academic term.

Lundeberg, M. A., & Moch, S. D. (1995). Influence of social interaction on cognition: Connected learning in science. *Journal of Higher Education, 66*(3), 312-335.
This article explores the use of Supplemental Instruction (SI) for increasing the academic success of women in science. "Connected knowing" -- a preferred learning environment for women that is a personal, cooperative approach to learning -- is thought by some to more naturally occur in SI sessions rather than the traditional pedagogical style used by most classroom professors. A research study of nursing students at the University of Wisconsin (River Falls) was conducted to test this idea. Qualitative research studies of the SI sessions suggested the following themes: spirit of cooperation, a circle of community, a shift of power to the SI participants, and risk-taking behavior (acknowledge uncertainty, experiment new ideas without fear of lower grades or punishment). Cognitive learning aspects included confirming the capacity for learning (encouragement), calibrated teaching (SI leader adjusted SI session agenda), and connected learning (placing abstract class lectures into context of personal lives). The article author provides several suggestions on how the classroom professor can introduce several of the SI session activities into their lecture sessions.

Lupkin, M. (1994, 1994, July 28). Linking science to students' lives. This summer program offers academic aid to minorities., *Philadelphia Inquirer Newspaper,* p. 3.
This newspaper articles mentions that Supplemental Instruction (SI) is a component in a special program for minority students at Rutgers University at Camden (PA) called "Success in the Sciences." Students are brought in for a special four-week enrichment program before the beginning of the freshman year to prepare them for the rigor of courses at Rutgers. SI is offered in connection with their first-year courses in math, chemistry and biology. The program has been partly funded with a $500,000 grant from the William Penn Foundation and $50,000 grant from the Coca-Cola Foundation.

MacGregor, J. (2000). Restructuring large classes to create communities of learners. In J. MacGregor, J. L. Cooper, K. A. Smith & P. Robinson (Eds.), *Strategies for energizing large classes, New Directions for Teaching and Learning, No. 81* (pp. 47-61). San Francisco: Jossey-Bass
This article provides an overview of a variety of programs for providing peer collaborative learning groups either inside or outside the classroom. The Emerging Scholars Program (ESP) and Supplemental Instruction (SI) have several pages of text devoted to both of them providing a basic program overview and several citations to research studies that support their program claims of effectiveness for improved student outcomes.

MacIsaac, D. L., Falconer, K., A, Maglione, C. A., & Masxka, C. (2002). *Using Supplemental Instruction to improve minority success in gatekeeper science courses.* Conference Proceedings of the 225th American Chemical Society National Meeting, New Orleans, LA.
This paper provides a post-hoc study of the use of Supplemental Instruction (SI) in the department of physics at SUNY Buffalo State College (Buffalo, NY). The study examined the impact of SI with 6,000 students over six semesters. Irrespective of student preparation level, the SI participants earned higher grades than non-participants. There were significant academic achievement gaps between the minority and majority student regarding preentry attributes. There differences were reduced to non-significance for students who participated in SI. Qualitative research confirmed the effectiveness for minority students, especially for those who were Native-American.

Macisaac, D. L., Falconer, K. A., & Maxka, C. (2003). *Using Supplemental Instruction to improve minority success in gatekeeper science courses.* Conference Proceedings of the 225th American Chemical Society National Meeting, New Orleans, LA. For more information, contact the authors at the Department of Physics, SUNY Buffalo State College, 222SCI Bldg BSC, 1309 Elmwood Ave., Buffalo, NY 14222, macisadl@buffalostate.edu
Supplemental Instruction (SI) was used at Buffalo State College (NY) and several others to improve the academic achievement of minority students enrolled in challenging science courses. A study of over 6,000 students over six semesters compared SI participants and nonparticipants. Outcomes included: higher grades regardless of ethnic or racial background. With SI as a covariate, the academic achievement of all ethnic groups was the same.

Mack, A. C. (2007). *Differences in academic performance and self-regulated learning based on level of student participation in Supplemental Instruction.* (Ph.D. dissertation), University of Central Florida, Orlando, FL.
This study examined differences in academic performance and self-regulated learning based on levels of student participation in Supplemental Instruction (SI) sessions in two introductory undergraduate biology and chemistry courses offered at University of Central Florida in the Spring 2006 semester. The sample consisted of 282 students enrolled in the biology class and 451 students enrolled in chemistry. Academic performance was measured using students' final course grades and rates of withdrawal from the courses. The self-regulated learning constructs of motivation, cognition, metacognition, and resource management were measured using the Motivated Strategies for Learning Questionnaire (MSLQ). Relationships between students' gender and ethnic background and levels of SI participation were also analyzed in this research. Findings in both biology and chemistry courses revealed a statistically significant decrease in student motivation from beginning to end of semester. In chemistry, frequent SI participants also showed statistically significantly higher levels of motivation at the end of the semester than occasional and non-SI participants. There were no statistically significant gains in cognitive, metacognitive, and resource management strategies from beginning to end of semester. However, statistically significant differences in resource management were observed at the end of the semester among SI attendance groups in both courses. Students in the high SI attendance group were more likely to use learning resources than those who did not participate regularly or did not participate at all. Statistically significant differences in academic performance based on students' SI participation were found in both biology and chemistry courses. Frequent SI participants had significantly higher final percentage grades and were more likely to receive grades of A, B, or C, than those who either did not attend SI regularly of did not participate at all. They were also less likely to withdraw from the course than occasional or non-SI participants. In biology, no relationship between SI participation, gender, and student ethnic background was found. In chemistry, female students were significantly more likely to attend SI regularly than males. Chemistry minority students had significantly higher representation among occasional SI participants. An important implication involved the use of pedagogical approaches that make lecture classrooms more interactive and encourage student motivation and engagement. This study could be replicated in other science and non-science courses that offer SI sessions. Additional factors in the success of SI programs and student motivation can be added, such as SI leaders' experience and major. Follow-up studies on students who completed the courses included in this study can be conducted to determine whether they reenrolled in other science courses, continued attending SI sessions, and gained self-regulated learning skills.

Madyun, N., Grier, T., Brothen, T., & Wambach, C. (2004). Supplemental Instruction in a personalized system of instruction General Psychology course. *The Learning Assistance Review, 9*(1), 7-15.
At the General College in the University of Minnesota the Supplemental Instruction model was modified to better meet the needs of the TRIO students enrolled in a general

psychology course. Rather than the traditional voluntary attendance model, these students were required to attend a college credit course that resembled a mandatory version of SI that meet twice each week throughout the semester. The SI course had six objectives: (a) teach the students to use the textbook as a primary resource; (b) build critical thinking skills; (c) self-regulation, selfing monitoring, meta-cognitive awareness, concentration, and peer support; (d) develop peer support for learning; (e) final exam preparation; and (f)provide explicit instruction and exercise3s geared toward helping students understand the nature and structure of the psychology course. A quasi-experimental evaluation design was used. The TRIO students enrolled in the SI course had higher grades than a comparison group of nonparticipating TRIO students.

Mahdi, A. E. (2004). *Peer-supported learning groups: A collaborative approach to supporting students learning in engineering and technology.* Conference Proceedings of the WSEAS, Venice, Italy. Retrieved from http://www.wseas.us/e-library/conferences/venice2004/papers/472-296.pdf
This paper describes a non-traditional tutoring programme based on collaborative peer-support learning approach, and reflects on two years of its implementation to specific subjects in engineering and information technology based courses at the University of Limerick in Ireland. The programme, known as the Peer-Supported Learning Groups (PSLG), is an academic enrichment scheme which has been developed by adapting the SI model such that it meets the needs of the students in Ireland and, at the same time, fits into the Irish third-level education system. The paper begins by giving a rationale for the introduction of the PSLG to the targeted subjects and the reasons for choosing the SI model. This is followed by description of the operational structure of the programme highlighting the difficulties encountered at the initial stages and the measures taken to alleviate these difficulties. Quantitative measures for evaluating the effect of the PSLG on student's performance, as well as analysis of feedback collected from the students and the leaders, are presented and discussed. The paper concludes by outlining issues for improving the current programme and associated further developments.

Mahdi, A. E. (2006). Introducing peer-supported learning approach to tutoring in engineering and technology courses. *International Journal of Electrical Engineering Education, 43*(4), 277-287.
Based on the Supplemental Instruction (SI) model, an adapted model is being used with electronic engineering and ICT-based courses at the University of Limerick in Ireland. Known as Peer-Supported Learning Groups (PSLG) this academic enrichment scheme fits into the Irish third-level education system. This paper begins by giving a rationale for the introduction of the PSLG to the targeted subjects, followed by descriptions of the operational structure of the program highlighting the difficulties encountered at the initial stages and the measures taken to alleviate these difficulties. Quantitative measures for evaluating the effect of the PSLG on students' performance, as well as analysis of feedback collected from the students and the leaders, are presented and discussed. Participating students earned higher scores on the mid-term and final exams. In addition, the PSLG participating students maintained their advantage over those who did not participate in subsequent academic terms. The paper concludes by outlining issues for improving the current programme and associated further developments.

Maim, J., Bryngfors, L., & Morner, L.-L. (2012). Supplemental Instructional for improving first year results in engineering studies. *Studies in Higher Education, 37*(6), 655-666. doi: 10.1080/03075079.2010.535610.
Many studies have been made on the impact of supplemental instruction in supported courses, with most showing significantly better examination results for students attending supplemental instruction in comparison to those who do not. However, remarkably little attention has been devoted to following up whether the benefits of supplemental instruction reach beyond the course it supports. The present study focuses on the influence of supplemental instruction on the overall academic performance during the first year, for undergraduate engineering students at a Swedish university. The results show that students with average and high supplemental instruction attendance do significantly better than students not attending in terms of overall first-year credit performance. Students with low, average and high prior academic achievement all benefit from attending supplemental instruction sessions. The data also suggests that the transferable effects of study strategies and skills to non-supplemental instruction courses are substantial for attendees, leading to better results in these courses.

Maim, J., Bryngfors, L. E., & Morner, L.-L. (2011). *Failing on the first major exam at university in spite of attending Supplemental Instruction (SI) sessions – was SI just a waste of time?* Unpublished manuscript. Center for Supplemental Instruction, School of Engineering, Lund University. Lund, Sweden.
The main emphasis and outcome from almost all investigations made on Supplemental Instruction show that SI improves grades, percentage of students passing the course as well as increasing student retention. But what happens to students that failed on the SI supported course in spite of being active participants at SI-sessions? Did the extra effort put in by attending SI-sessions reward the students later on or was it just a waste of time? These questions have received no attention in previous studies on Supplemental Instruction. The main objective of the present study is to investigate these questions in an engineering education environment with focus on first-year students. The results of the study show that failure on the first major exam means a drastically reduced chance of successful freshman year studies. However, a good attendance record at SI-sessions seems to increase chances of student success although you failed the first exam. For instance, a student with high SI attendance during the first year takes 11 credits more than a student that did not participate in SI sessions. Almost two thirds of students failing the first exam but with high first year SI attendance fulfill the strategic goal of successful studies for the school of engineering at Lund University. This can be compared to one fourth having freshman year study success among students with no SI attendance. These results clearly indicate that attendance at SI sessions tend to reward participants in the long run although results in the short perspective – like failing the first exam in an SI supported course – are negative.

Makins, V. (1991, 1991, July 5). Passing on a year's experience: How peer tutors at Kingston Polytechnic help students combat isolation, *The London Times,* pp. 1-3.

The article describes how Kingston Polytechnic in England has customized the use of Supplemental Instruction (SI) at their institution. The campus SI supervisor reports that a challenge in the SI sessions is the requirement that SI leaders redirect all questions back to the SI participants to answer.

Maldonado Gonzalez, M. (2000). The Supplemental Instruction culture: A qualitative program evaluation of context-specific patterns [Dissertation, Washington State University, 1999]. *Dissertation Abstracts International, 60*(11), 3904.
This study explores the Supplemental Instruction (SI) world at a land grant university of the United States of America and the peripheral cultural ecologist it generates. The qualitative study was conducted over a period of 10 weeks and it involved 50 students, 6 faculty members, 4 peer instructors and 1 staff member. It followed a two-phase research design. In the first phase, the delimitation of assessment goals and revision of program documents took place. In the second, phase the researcher conducted field observation, interviews, and surveys, and data were screened through several conceptualizations: participation frameworks (Shiffrin), linguistic of discrimination (Fawler), classroom ecology (Bowers & Flinders), teaching paradigms (Brooks & Brooks), and proxemics of communication (Hall). Five themes emerged: (1) Collaborative vs. competitive frameworks of participation: Unlike the discriminatory patterns of communication existing in the at-risk courses, communication in the study sessions is a pro-social activity in which students and leader share participatory roles. (2) Symmetrical vs. asymmetrical patterns of speech visibility: The relationship between the SI leader and the students exemplifies a proactive transmission of power that increases the students' speech visibility. A factor that is minimized in at-risk courses where the teacher's visibility is maximized. (3) Traditional vs. constructivist power ecology: The SI support a constructive flow of authority distributing participatory power among the students, who assume learning responsibilities through processes of collective thinking, negotiation of solutions, and peers' assistance. (4) Linguistic signs of coercive paternalism vs. nurture: The contrast between the superior-subordinate relationship in the at-risk-courses and the egalitarian relationship in the study sessions is exemplified through the linguistic indicators peculiar to the facilitators' discourse in each of these environments. The at-risk courses facilitator's discourse contains linguistic signs of coercive paternalism, whereas the SI leaders' discourse reflects feminist caring linguistic signs. (5) Proxemicist alienation versus proxemicist inclusion: The proxemics and kinetic indicators embedded in the context of the at-risk courses impact the participants' territorial distance creating a climate of exclusion. In the study sessions the territorial distance is reduced, which fosters an atmosphere of students' inclusion. The study profiles the academic environment of SI and the interactions the participants displayed. Attention is given to the students' perceptions of SI and how it affected their academic performance. It proposes a grounded theory about the interplay of two academic cultures, suggests strategies for SI improvement, teaching development and future research.

Malm, J., Bryngfors, & Morner, L. (2013). *The potential of Supplemental Instruction in engineering education.* Conference Proceedings of the 41st European Society for

Engineering Education Conference, Leuven, Belgium. Retrieved from http://www.sefi.be/conference-2013/images/45.pdf
The results from this study show that both the percentage of students passing a difficult first-year engineering course, and scores on the course exams, are higher for students attending SI compared to students not attending. There is also a clear relation between SI attendance and student performance, with higher attendance leading to higher student performances. The study also shows that female students are attending SI at a higher rate than male students. However, both genders seem to benefit to the same degree by attending SI meetings. Also all students, independent of prior academic ability, benefit from attending SI. A qualitative study based on a questionnaire to students attending SI, suggests that SI meetings provide elements missing in other scheduled learning opportunities in the courses, which are important for understanding course material

Malm, J., Bryngfors, L., & Morner, L.-L. (2012). Benefits of guiding Supplemental Instruction sessions for SI leaders: A case study for engineering education at a Swedish University. *Journal of Peer Learning, 5*(1). Retrieved from http://www.si-mentor.lth.se/fileadmin/lth/omlth/pedagogiskaprojekt/simentor/Benefits_of_guiding_JPL.pdf.
The study indicates that students who work as Supplemental Instruction (SI) leaders gain several benefits from their SI experience. The benefits can be divided into the following main themes: Improved communication skills; Improved interpersonal skills (including abilities to listen to other people's thoughts and reasoning; creating trust between yourself and your group members; to meet and inspire different individuals; to make a group of individuals enthusiastic about performing a task; and to get students to help each other); Improved leadership skills (including being a leader of a group, talking in front of others, leading a discussion, organizing the work for a group, and creating an easy-going, positive, and supportive atmosphere at thelearning sessions); Improved self confidence; and Deeper understanding of course content

Malm, J., Bryngfors, L. E., & Morner L.-L. (2010). Supplemental Instruction (SI) at the Faculty of Engineering (LTH) Lund University, Sweden. An evaluation of the SI-program at five LTH engineering programs Autumn 2008. *Australasian Journal of Peer Learning, 3*(1), 38-50. Retrieved from http://ro.uow.edu.au/ajpl/vol3/iss1/5.
The study presents an evaluation of the Supplemental Instruction (SI) program in five engineering programs within the Faculty of Engineering (LTH) based on data from questionnaires to SI participants and SI leaders. Outcomes studied were their responses to the survey questions, credits taken by the students during the first year, and average grade data from high school for the first year students. The results show that participation in SI sessions markedly improves the chances of student success in studies during the first year and that the SI program creates a positive social introduction to engineering studies. The SI sessions also improved the participants' study techniques and development of common skills important for the engineer, such as problem solving, group work, and presenting/discussing results.

Malm, J., Bryngfors, L. E., & Morner, L.-L. (2011). Improving student success in difficult engineering education courses though Supplemental Instruction (SI): What is the impact of the degree of SI attendance? *Journal of Peer Learning, 4*(1), 16-23. Retrieved from http://ro.uow.edu.au/ajpl/vol4/iss1/4.
The main emphasis and outcome from almost all investigations made on Supplemental Instruction show that SI improves grades, percentage of students passing the course as well as increasing student retention. But what happens to students that failed on the SI supported course in spite of being active participants at SI-sessions? Did the extra effort put in by attending SI-sessions reward the students later on or was it just a waste of time? These questions have received no attention in previous studies on supplemental instruction. The main objective of the present study is to investigate these questions in an engineering education environment with focus on first-year students. The results of the study show that failure on the first major exam means a drastically reduced chance of successful freshman year studies. However, a good attendance record at SI-sessions seems to increase chances of student success although you failed the first exam. For instance, a student with high SI attendance during the first year takes 11 credits more than a student that did not participate in SI sessions. Almost two thirds of students failing the first exam but with high first year SI attendance fulfill the strategic goal of successful studies for the school of engineering at Lund University. This can be compared to one fourth having freshman year study success among students with no SI attendance. These results clearly indicate that attendance at SI sessions tend to reward participants in the long run although results in the short perspective – like failing the first exam in an SI supported course – are negative.The student attendance pattern was divided into four quartiles from low to high attendance. There was a progressive relationship between the number of times attended and the final course grade in engineering courses.

Malm, J., Bryngfors, L. E., & Morner, L.-L. (2011). Supplemental Instruction: Whom Does it Serve? *International Journal of Teaching and Learning in Higher Education, 23*(3), 282-291. Retrieved from http://www.isetl.org/ijtlhe/pdf/IJTLHE1025.pdf.
Supplemental Instruction (SI) is today a well-known academic assistance program that provides help for students in “difficult” courses. SI has repeatedly been shown to decrease the percentage of failures in the course as well as increasing course grades for students who attended SI sessions. Although SI is open for all students, its main objective is to come to terms with students’ high failure rates and retention problems. And even if SI has been shown to reduce failure rates and increase reenrollment figures, surprisingly few studies have been devoted to determine how well it benefits students with different prior academic ability. These studies tend to show that “weaker” students benefit from SI. The results for “average” and “strong” students are not as clear. The present study focuses on the benefit of SI for “weak”, “average,” and “strong” first-year engineering students in a calculus course. The results show that all three groups benefit from SI and that the failure rates among students with low prior mathematics achievement who had high SI attendance are almost as low as for students with high prior mathematics achievement who do not attend SI.

Malm, J., Morner, L.-L., Bryngfors, L., Edman, G., & Gustafsson, L. (2012). Using Supplemental Instruction to bridge the transition from secondary to tertiary education. *International Journal of Education, 4*(3). Retrieved from http://www.si-mentor.lth.se/fileadmin/lth/omlth/pedagogiskaprojekt/simentor/SI-upper_secondary_IJE.pdf.
Supplemental Instruction (SI) is today a well known academic assistance program, providing help for students in "difficult" courses at colleges and universities. Little attention has been paid however to the possibility of also implementing the SI program in upper secondary school. In this study we present qualitative results from such an SI program in a Swedish setting. Here, students from the faculty of engineering at Lund University, act as SI-leaders at eleven upper secondary schools in the local region, in subjects such as math, physics and chemistry. The main conclusion is that the SI-methodology also seems to work in an upper secondary school environment. The students who attend SI regularly appear to obtain new study strategies to increase their understanding of the subject, besides improving on general skills such as team-work, communicating on a subject, and making presentations in front of others. There are several advantages for the schools and university involved. For example they gain a formal and an informal link, which can prove useful in many circumstances when an exchange of information is needed, and both can use SI as a means to boost recruitment. For the upper secondary school, the students can get an alternative view on subjects, which hopefully stimulates interest and understanding. The students also get a more mature role model to turn to. For the university an additional advantage is that a more informal view of what it is like to study at university can be provided to upper secondary school students.

Maloney, R. S. (1992). *The Supplemental Instruction program as an alternative field experience for secondary education majors.* (Bachelor of Science with Honors thesis), University of New Orleans, New Orleans, LA.
The College of Education at the University of New Orleans, LA (UNO) requires all education majors to complete twenty five hours of a Professional Laboratory Experience (PLE), which has traditionally been as a teacher aide in an area high school, prior to the student teaching experience. The goal of the PLE is to provide a varied and enriching teaching experience for prospective student teachers. The primary purpose of this study is to study the use of Supplemental Instruction (SI) in College Life sections of English 0150 during Fall 1991 to provide an effective alternative field experience for secondary education majors prior to student teaching. Students were divided into two groups: one group served as SI leaders in the English course and the other group were placed in the traditional high school teacher aide position. Surveys were given to the secondary education majors -- those who completed their PLE at the high school and those who served as SI leaders at the college -- prior to and at the completion of their PLE (course name EDCI 3205) to measure their preparedness to perform specific teaching tasks. The results suggest that there is a greater change in preparedness levels for those who participated as SI leaders in the following areas: (a) lesson preparation (write performance objectives, choose appropriate materials, vary methodology, allocate time for content coverage, construct evaluation instruments, and provide feedback of assessment and evaluation results); (b) classroom management

(manage time, mange classroom routines, maintain student engagement, manage task related behavior, and monitor and maintain student behavior); and c) instructional skills (initiate lessons and activities, provide accurate content information, emphasize essential elements of content knowledge, and implement learning activities at an appropriate pace). The researcher suggested that one of the reasons for the significant gains for the SI leaders was that they had more power to select and experiment with activities. The high school teaching aides were limited by the cooperating high school teacher. Based upon analysis of the data, the researcher suggests that SI can serve as an alternative experience for education majors.

Mannikko-Barbutin, S., & Sjogrund, B. (2004). *The role of the SI leader in high school: Meeting new challenges.* Conference Proceedings of the 3rd International Conference on Supplemental Instruction, Boston, MA.
This conference paper describes the use of Supplemental Instruction (SI) at a high school in Sweden. The SI program is extended to secondary schools to ease the transition of the recent high school graduates as they enroll at the college-level.

Marcus, D. (1996). Supplemental Instruction with mentoring support at Anne Arundel Community College. In R. Shoenberg (Ed.), *Lessons learned from Fund for the Improvement of Postsecondary Education Projects III*. Washington, D.C.: Fund for the Improvement of Postsecondary Education, U.S. Department of Education.Retrieved from http://www.ed.gov/about/offices/list/ope/fipse/lessons4/aacc.html.
This chapter describes the use of Supplemental Instruction (SI) at Anne Arundel Community College (Arnold, MD) for faculty development purposes in addition to increasing academic achievement of participating students. SI leaders were paired with faculty mentors who participated in the initial training workshop for SI leaders. For the first four weeks of the term the faculty mentor participated as learners by attending class lectures and SI sessions whose student SI leaders they supervise and by keeping a journal of their experiences. Mentors were placed in courses outside their discipline so that they would focus on the learning process rather than being tempted to critique the instructional content of the course professor. Mentors reported that they increased their own teaching skills and their view of the learning process.

Marhaya, L. (2014). Application of Vygotsky's social constructivism theory on lecturers' perspective of Supplemental Instruction peer facilitation model. *Mediterranean Journal of Social Sciences, 5*(11), 37-42. doi:10.5901/mjss.2014.v5n11p37 Retrieved from http://www.mcser.org/journal/index.php/mjss/article/view/2998/2958.
The study seeks to gather a perspective on the impact of supplemental instruction model as a student enhancement support mechanism from lecturers involved in two modules supported in the programme. This is a qualitative case study design study of a Supplemental Instruction model used as a student enhancement support mechanism by lecturers in one institution of higher learning in the Eastern Cape Province. Four lecturers, who are currently utilizing this model, which consist of two from each programme involved in the study, have been drawn. These participants have been purposefully selected based on knowledge and utilization of this tool. A narrative approach soliciting their stories through the use of open ended questionnaire is seen as

ideal in order to get rich data. Emerging themes were analysed using a thematic approach. The results suggest that there is a general satisfaction on how the academics perceive, experience and what they expect from the programme. The study concludes that all stakeholders could benefit if good relations are maintained. It is recommended that they should be continuous strengthening of relations amongst all stakeholders involved in the programme.

Marra, R. M., & Litziner, T. A. (1997). *A model for implementing Supplemental Instruction in engineering.* Conference Proceedings of the Annual Conference on Frontiers in Education Conference, Piscataway, NJ, USA.
Supplemental Instruction (SI) is used at Pennsylvania State University (University Park, PA) to help students earn higher grades in electrical engineering courses. Penn State's SI program was piloted as a part of our larger Undergraduate Teaching Intern Program. The Teaching Intern (TI) Program allows undergraduate students to partner with a professor on a particular course in order to learn about the responsibilities of being a faculty member. This paper provides an overview of both the SI and TI programs, specific details on how to run a course to train for these programs, and preliminary results of the SI program in terms of experiences of the three student SI leaders and achievement results of those students who attended SI sessions versus those who did not.

Marshall, S. (1994). Faculty development through Supplemental Instruction. In D. C. Martin & D. Arendale (Eds.), *Supplemental Instruction: Increasing achievement and retention* (pp. 31-40). New Directions for Teaching and Learning No. 60. San Francisco, CA: Jossey-Bass
Involvement of faculty members with the Supplemental Instruction program can lead to personal and professional renewal for the faculty participants. The author describes the impact of SI with faculty members at Salem State College. Faculty members received an indirect faculty development experience through the following activities: attending training workshops initially designed for the SI leaders; frequent meetings with the SI leader assigned to their class; and participating in monthly seminars that involved SI leaders in discussing learning and teaching skills (group facilitation skills, critiques of teaching presentations, motivation activities, dealing racism and sexism, reviewing SI data studies). Faculty members who participated in this faculty development project reported numerous positive changes in their attitudes and classroom behaviors.

Martin, D. C. (1980). Learning centers in professional schools. In K. V. Lauridsen (Ed.), *Examining the scope of learning centers* (pp. 69-79). San Francisco, CA: Jossey-Bass
This chapter describes the role of academic assistance for students in professional schools. The use of Supplemental Instruction (SI) for medical students is described. Several research studies suggest that SI contributes to higher academic achievement and the rate of D, F and course withdrawals have been reduced by 20 percent. Fifty to seventy percent of the medical students enrolled in a given course participate in the service. Data suggests that there is a transfer effect of SI, students who take advantage of SI maintain their GPA lead over nonparticipating students during the following academic term in the second course in the same sequence.

Martin, D. C., & Arendale, D. R. (1990). *Supplemental Instruction: Improving student performance, increasing student persistence*. Unpublished manuscript. University of Missouri-Kansas City. Kansas City, MO. Retrieved from ERIC database. (ED327103)
This report describes the Supplemental Instruction (SI) program at the University of Missouri-Kansas City. Among the topics in the paper: narrative overview of the SI model; history of the development of SI at UMKC and other institutions across the U.S.; outcomes for students and the institution; and potential for adoption by other institutions.

Martin, D. C., & Arendale, D. R. (1992). Foundation and theoretical framework for Supplemental Instruction. In D. C. Martin & D. R. Arendale (Eds.), *Supplemental Instruction: Improving first-year student success in high-risk courses* (2nd ed., pp. 41-50). Columbia, SC: National Resource Center for The Freshman Year Experience and Students in Transition.(ERIC Document Reproduction Service No. ED354839). Retrieved from https://netfiles.umn.edu/users/arend011/www/peer/SIFYEmonograph.pdf.
This chapter provides an overview of SI's educational pedagogy. Piaget and Vygotsky's writings on constructivism serve as a major basis for describing how students "construct" their own knowledge. This requirement for students to actively create their own knowledge drives many SI session strategies. Tinto's theories on student departure based on students' need for academic and social integration also guide the implementation of the SI program. Additional theorists include Keimig (Hierarchy of Learning Improvement Programs), Weinstein (metacognition), and a variety of researchers concerning collaborative learning.

Martin, D. C., & Arendale, D. R. (1992). Review of research on Supplemental Instruction. In D. C. Martin & D. Arendale (Eds.), *Supplemental Instruction: Improving first-year student success in high-risk courses* (2nd ed., pp. 19-26). Columbia, SC: National Resource Center for The Freshman Year Experience and Students in Transition.(ERIC Document Reproduction Service No. ED354839). Retrieved from https://netfiles.umn.edu/users/arend011/www/peer/SIresearch93.pdf.
This chapter compares a national research study concerning the effectiveness of Supplemental Instruction with studies from the University of Missouri-Kansas City. The National Center for SI collects SI data from a diverse sample of higher education institutions from across the U.S. The national study included data from 49 institutions that had offered SI in 1,477 courses of diverse curriculum areas. The findings suggest that SI participants in comparison with non-SI participants earn higher final course grades (2.46 vs. 2.12), earn a higher percent of A and B final course grades, and receive a lower percent of D, F and withdrawal final course grades (23% vs. 38%). Data collected from 1980 to 1992 in 217 courses with an enrollment of 9,365 students at UMKC confirms the national studies. Additional studies conducted at UMKC suggested higher academic achievement for SI participants with reenrollment (90.0% vs. 81.5%) and graduation rates (30.6% vs. 18.2%). Several studies from UMKC studied the potential impact of student motivation levels, ethnicity, and previous levels of academic preparation. These were not found to have a statistically significant impact upon the research studies.

Martin, D. C., & Arendale, D. R. (1992). Supplemental Instruction in the first college year. In D. C. Martin & D. Arendale (Eds.), *Supplemental Instruction: Improving first-year student success in high-risk courses* (2nd ed., pp. 11-18). Columbia, SC: National Resource Center for The Freshman Year Experience and Students in Transition.(ERIC Document Reproduction Service No. ED354839). Retrieved from https://netfiles.umn.edu/users/arend011/www/peer/SIfirstyear.pdf.
This chapter describes how the Supplemental Instruction program can help meet some of the unique needs presented to students during their first year of college: integrating learning/study strategies within regular content courses; and supporting students enrolled in historically-difficult first-year courses; assisting student subpopulations make a successful transition into college (academically talented, remedial/developmental, field-dependent). Like other successful programs for students in the first-year, central objectives of the SI program are to: develop a felt sense of community; involvement of students in the life of the institution; and providing an environment to support academic and social integration.

Martin, D. C., & Arendale, D. R. (Eds.). (1992). *Supplemental Instruction: Improving first-year student success in high-risk courses* (2nd ed. Vol. 7). Columbia, SC: The University of South Carolina and the National Resource Center for the Freshman Year Experience and Students in Transition.(ERIC Document Reproduction Service No. ED354839). Retrieved from
https://netfiles.umn.edu/users/arend011/www/peer/SIFYEmonograph.pdf
This monograph describes Supplemental Instruction (SI), a study assistance program designed to improve the academic success of college freshmen based on the idea that if students are not being successful in courses then perhaps they will withdraw from the institution. The first chapter reviews the SI model. Chapter two explains in detail how SI works in the freshman year. Chapter three offers a review of the research on SI. Chapter 4 examines why educators and students choose SI. Chapter five shows how SI has been adapted to an urban high school, to English composition classes, and to a law school at the University of Missouri-Kansas City. The last chapter reviews the foundation and theoretical framework of SI. An appendix lists institutions currently using SI.

Martin, D. C., & Arendale, D. R. (1992). Understanding the Supplemental Instruction model. In D. C. Martin & D. R. Arendale (Eds.), *Supplemental Instruction: Improving first-year student success in high-risk courses* (2nd ed., pp. 3-10). Columbia, SC: The National Resource Center for The Freshman Year Experience and Students in Transition.(ERIC Document Reproduction Service No. ED354839). Retrieved from https://netfiles.umn.edu/users/arend011/www/peer/UnderstandingSI93.pdf.
Theoretical and philosophical underpinnings for the Supplemental Instruction model is included in this overview. Some of the major issues are reviewed: common factors in student attrition; focus on "high-risk courses" rather than "high-risk students;" proactive assistance before problems occur; key SI features; essential partners for SI success; creating awareness and generating support for SI on campus; and movement from a reactive to a proactive mode of student academic assistance.

Martin, D. C., & Arendale, D. R. (Eds.). (1994). *Supplemental Instruction: Increasing achievement and retention*. New Directions for Teaching and Learning No. 60. San Francisco, CA: Jossey-Bass
This monograph features nine chapters concerning: overview and foundation of the Supplemental Instruction (SI) program; use of SI for faculty development; SI in the content areas (humanities, mathematics, chemistry); research studies concerning SI; and the newest innovation of SI called Video-based Supplemental Instruction (VSI).

Martin, D. C., & Arendale, D. R. (1997). *Mainstreaming of developmental education: Supplemental Instruction and Video-based Supplemental Instruction*. Unpublished manuscript. University of Missouri-Kansas City. Kansas City, MO. Retrieved from https://netfiles.umn.edu/users/arend011/www/peer/mainstreamDE97.pdf
This paper describes the development of Supplemental Instruction (SI) and Video-based Supplemental Instruction (VSI) to serve an effective way to mainstream the best features of developmental education into traditional college-level courses. The historical development and modern day implementation of both programs are described

Martin, D. C., & Arendale, D. R. (1998). Supplemental Instruction and Video-based Supplemental Instruction. In A. C. P. A. American Association for Higher Education, and National Association of Student Personnel Administrators, (Ed.), *Powerful partnerships: A shared responsibility for learning* (pp. 6-7). Washington, D.C.: Editors
This report describes the different ways that institutions build campus partnerships to deepen student learning both inside and outside the classroom. AAHE, ACPA, and NASPA formed a Joint Task force on Student Learning to identify successful models that have implications for pedagogy, curricula, learning environments, and assessment. Both the Supplemental Instruction and Video-based SI programs were highlighted as being a model for the first principle of learning and collaborative action: Learning is fundamentally about making and maintaining connections: biologically through neural networks; mentally among concepts, ideas, and meanings; and experientially through interaction between the mind and the environment, self and other, generality and context, deliberation and action.

Martin, D. C., Arendale, D. R., & Blanc, R. A. (1997). *Mainstreaming of developmental education: Supplemental Instruction and Video-based Supplemental Instruction*. Unpublished manuscript. University of Missouri-Kansas City. Kansas City, MO. Retrieved from https://netfiles.umn.edu/users/arend011/www/peer/SIFYEmonograph.pdf
This manuscript was originally delivered as a paper at a special conference in January 1998 on "Alternatives to Developmental Education" that was sponsored by the U.S. Department of Education funded National Center for Lifelong Learning based at Stanford University (CA). The conference was convened to deal with the growing concern by some states regarding traditional developmental education credit courses. The conference was designed to identify several alternative ways of accomplishing the same purposes as developmental courses (e.g., linked courses, critical thinking courses, SI, VSI). This paper first provides an overview of SI and VSI. Then it

concludes with the pedagogical basis for both. In developmental education, research scholars embrace the reductionist approach by seeking first to identify the separate and distinct skills required for academic success, then to measure the degree to which these are present or absent in the individual, and finally to isolate and teach those skills that are in deficit. Practitioners assume that mastery of a series of independent skills lead to academic competency. SI and VSI break with this view and provide a holistic approach to education. Given sufficient efficiency on task, effective guidance, and the time and opportunity to do so, any serious student can learn.

Martin, D. C., Arendale, D. R., & Widmar, G. E. (1998). Creating communities for learning. In L. Hardge (Ed.), *Bridges to student success: Exemplary programs 1998* (pp. 27-33). Washington, D.C.: National Association for Student Personnel Administrators
This monograph chapter provides a basic overview of the Supplemental Instruction (SI) model. In addition to the basic overview, the authors describe how SI provides a pluralistic environment where students can learn to value the unique perceptions of others who may view the world differently than themselves. SI provides a structured environment for students to participate in learning communities outside the supervision of the class professor.

Martin, D. C., & Blanc, R. A. (1981). The learning center's role in retention: Integrating student support services with departmental instruction. *Journal of Developmental and Remedial Education, 4*(3), 2-4, 21-23.
This article provides a historical background for the creation of the Supplemental Instruction (SI) program at the University of Missouri-Kansas City. Research studies of SI in a first-year American history course at UMKC during Fall 1980 suggest the following: SI participants earned a higher percent of A and B final course grades (54.1% vs. 38.9%); had a lower rate of D, F and withdrawal grades (21.7% vs. 42.4%); had a higher rate of reenrollment the following academic term (86.2% vs. 72.1%); and there was no statistically significant differences (e.g., prior academic achievement, standardized test scores) between SI and non-SI participants.

Martin, D. C., & Blanc, R. A. (1984). Improving reading comprehension through reciprocal questioning. *Life Long Learning, 7*(4), 29-31.
"Reciprocal questioning" is a technique that promotes active learning. It helps students: a) become aware of the implicit as well as the explicit meaning of a reading passage; b) improve their analytic skills with respect to reading; c) improve their reasoning; and d) strengthen the questioning skills that are integral to comprehension. Reciprocal questioning is adapted from Manzo's "The ReQuest Procedure." Reciprocal questioning is a strategy used as appropriate with Supplemental Instruction or Video-based Supplemental Instruction sessions.

Martin, D. C., & Blanc, R. A. (1994). Supplemental Instruction: An organic model in transition, the views of SI's initiator. In C. Rust & J. Wallace (Eds.), *Helping students to learn from each other: Supplemental Instruction, SEDA Paper 86* (pp. 91-94). Birmingham, England: Staff and Educational Development Association

This chapter describes the history and development of Supplemental Instruction in the United States by the program's creator. The essential elements of successful SI programs are described. In addition, the chapter reviews the adaption of the SI model for the British higher education system through the work of Jenni Wallace of Kingston University, London.

Martin, D. C., & Blanc, R. A. (1994). Video-Based Supplemental Instruction: A pathway to mastery and persistence. In D. C. Martin & D. Arendale (Eds.), *Supplemental Instruction: Increasing achievement and retention* (pp. 83-92). New Directions for Teaching and Learning No. 60. San Francisco, CA: Jossey-Bass, Inc.
The Video-Based Supplemental Instruction (VSI) delivery system using Supplemental Instruction that is described here combines developmental studies with core curriculum courses, offering an alternative to remedial/developmental instruction. Students that are least prepared at the institution need a more powerful academic support service. The difference between the VSI approach and those traditionally used in postsecondary education lies in the centrality of students to the process as opposed to the centrality of the material to be learned: students conduct the preview; students determine the pace of the lecture; students assure their own mastery as the lecture progresses; students select the key points for immediate review; and students identify misconceptions and modify and adapt their conceptions to achieve, eventually, more complete understanding. VSI was designed to allow such students to both earn credit for core curriculum courses while they develop the requisite learning strategies needed for academic success. This provides an alternative way to provide developmental education.

Martin, D. C., Blanc, R. A., & Arendale, D. (1996). Supplemental Instruction: Supporting the classroom experience. In J. N. Hankin (Ed.), *The Community College: Opportunity and Access for America's First-Year Students* (pp. 123-133). Columbia, SC: University of South Carolina: The National Resource Center for The Freshman Year Experience and Students in Transition.(ERIC Document Reproduction Service No. ED393486). Retrieved from https://netfiles.umn.edu/users/arend011/www/peer/SItwoyear96.pdf.
This chapter reviews the impact of the Supplemental Instruction program with fifty-nine two-year colleges across the U.S. The research study contained reports from 480 classes that enrolled 23,979 students. The data suggests that SI participation was correlated with higher academic achievement: higher mean final course grades (2.30 vs. 1.63); higher percentage of A or B final course grades (50.6% vs. 32.9%); and lower rates of D, F and withdrawals (25.9% vs. 46.3%). Similar findings occurred when the data was separated by broad academic disciplines: business, health science, mathematics, natural science, social science/humanities, and technical/vocational. In addition, the themes of attrition identified by Tinto (adjustment, isolation, difficulty, and incongruence) are used as a paradigm to examine the possible reasons for the positive impact of the SI program. Several SI programs reported the use of SI for faculty development: faculty serve as SI supervisors and adopt SI sessions strategies into their own lectures; faculty SI supervisors provide requested feedback to the course professors that they observe concerning class presentation activities; and faculty who

observe SI sessions report using more student-led collaborative learning activities during their class sessions.

Martin, D. C., Blanc, R. A., & Arendale, D. R. (1994). Mentorship in the classroom: Making the implicit explicit. *Teaching Excellence, 6*(1), 1-2. Retreived from https://netfiles.umn.edu/users/arend011/www/peer/mentor97.pdf.
Based upon experiences gained through the Supplemental Instruction (SI) program, the authors make a number of suggestions on how faculty members can use SI strategies in their classes. Some suggestions include: remind students of the "big picture" throughout the academic term of the most important concepts; refer to the syllabus during the term so that students will value and use it; share the thinking process that the professor uses to solve the problems with the students; administer a short examination with low grade impact early in the academic term to give students an opportunity to test their comprehension level and encourage them to modify study behaviors and perhaps seek academic support (e.g., SI); provide visual matrices during lectures to give models to students on how to organize the material; and make explicit what is expected on examinations.

Martin, D. C., Blanc, R. A., & DeBuhr, L. (1982). Supplemental Instruction: A model for increasing student performance and persistence. In L. Noel & R. Levitz (Eds.), *How to succeed with academically underprepared students: A catalog of successful practices* (pp. 75-79). Iowa City, IA: ACT National Center for the Advancement of Educational Practices
This article provides a basic overview of the Supplemental Instruction (SI) program. Included is a research study of 746 students enrolled in seven Arts and Sciences courses in Spring semester 1980. SI participants earned higher mean final course grades (2.70 vs. 2.25) and received lower rates of D, F and withdrawal grades (18.4% vs. 44.0%).

Martin, D. C., Blanc, R. A., & DeBuhr, L. (Eds.). (1983). *Retention with integrity through Supplemental Instruction*. Kansas City, MO: The University of Missouri-Kansas City, Student Learning Center
This monograph provides a comprehensive overview of the Supplemental Instruction (SI) program. It can serve as a training manual for SI supervisors and SI leaders to implement the program on a college campus. Topics include: overview of SI; establishing and conducting SI sessions; guidelines for SI leaders; SI program evaluation procedures; writing lab adaptations of SI; adapting SI to English composition classes; SI on a small campus; student denial; and diagnosing learning problems of gifted adults.

Martin, D. C., Blanc, R. A., DeBuhr, L., Alderman, H., Garland, M., & Lewis, C. (Eds.). (1983). *Supplemental Instruction: A model for student academic support*. Kansas City, MO: The University of Missouri-Kansas City and ACT National Center for the Advancement of Educational Practices
This monograph provides a basic overview of the Supplemental Instruction (SI) model: basic overview; UMKC student academic performance in seven Arts and Sciences

courses during 1980 reported earlier in the 1983 article by Blanc, DeBuhr and Martin (final course grades, impact of student motivation, reenrollment rates, performance of students separated by upper and lower quartile scores, and changes in D, F and withdrawal rates for the courses) and new studies examining students of color and medical school students; generating campus awareness and support; case studies of SI's use outside of UMKC (Maple Woods Community College - MO, Bethel College - KS, Kansas State University - KS); training SI leaders; and evaluation procedures for program review.

Martin, D. C., DeBuhr, L., & Garland, M. (1987). *Developing critical thinking skills of college students through Supplemental Instruction*. Paper presented at the Third International Conference on Thinking, Honolulu, HI.
The authors describe the use of Supplemental Instruction (SI) for improving the critical thinking skills of students. Some SI session activities help foster improved thinking skills: modeling of thinking processes by the SI leader; probing questions; redirective and higher levels of questioning; facilitating student discussions of their thought processes; escalation of discussions from concrete to abstract levels; and precise use of content vocabulary.

Martin, D. C., & Gravina, M. (1990). Serving students where they fail: In class. *Thresholds in Education, 16*(3), 26, 28-30.
This article provides a general overview of the Supplemental Instruction (SI) model. Rather than focusing on "at-risk" students, the authors suggest that the emphasis should be placed on identifying historically difficult courses that create an environment that may be challenging for any student, despite previous academic success in other courses.

Martin, D. C., Hall, P. T., & Arendale, D. (1991). *Academic success for inner city high school youth: The positive effects of Supplemental Instruction with an urban high school.* Conference Proceedings of the National Association of State Universities and Land Grant Colleges Conference, Kansas City, MO. Retrieved from https://netfiles.umn.edu/users/arend011/www/peer/SIhighschool91.pdf
This paper describe the use of Supplemental Instruction (SI) with an urban high school in Kansas City, Missouri. Westport High School is a culturally-diverse school located in the central city. Over half the students were one or two years behind grade levels in reading and mathematics and an equal number were economically disadvantaged. SI was provided to students enrolled in 9th and 10th grade English and history classes. SI sessions were scheduled during a scheduled time during the school day three times each week. Research studies suggested that there was improvement in final course grades of students in the English (A and B grades: 28.7% vs. 13.6% before SI; F grades: 23.2% vs. 32.7% before SI)and history classes. Interviews with students and teachers suggest that participation in the SI program also promoted higher levels of class participation and higher achievement on standardized test scores.

Martin, D. C., Hall, P. T., & Arendale, D. (1992). Use of Supplemental Instruction at an urban high school. In D. C. Martin & D. Arendale (Eds.), *Supplemental Instruction:*

Improving first-year student success in high-risk courses (2nd ed., pp. 31-33). Columbia, SC: National Resource Center for The Freshman Year Experience and Students in Transition.(ERIC Document Reproduction Service No. ED354839). Retrieved from https://netfiles.umn.edu/users/arend011/www/peer/SIFYEmonograph.pdf.
The authors describe the use of Supplemental Instruction -- traditionally a post-secondary academic program -- with an urban high school in Kansas City, Missouri. Westport High School is a culturally-diverse school located in the central city. Over half the students were one or two years behind grade levels in reading and mathematics and an equal number were economically disadvantaged. SI was provided to students enrolled in 9th and 10th grade English and history classes. SI sessions were scheduled during a scheduled time during the school day three times each week. Research studies suggested that there was improvement in final course grades of students in the English (A and B grades: 28.7% vs. 13.6% before SI; F grades: 23.2% vs. 32.7% before SI) and history classes. Interviews with students and teachers suggest that participation in the SI program also promoted higher levels of class participation and higher standardized test scores.

Martin, D. C., & Hurley, M. (2005). Supplemental Instruction. In M. L. Upcraft, J. N. Gardner & B. O. Barefoot (Eds.), *Challenging & supporting the first-year student: A handbook for improving the first year of college* (pp. 308-319). San Francisco, CA: Jossey-Bass
This chapter provides an overview of Supplemental Instruction (SI). After providing guiding principles of SI, evidence of effectiveness is cited from the original developing site, University of Missouri-Kansas City as well as several other representative institutions. Two adaptations of the SI model are cited: Video-based SI and the Advanced Preparation Program. The chapter closes with recommendations for increasing the effectiveness of SI.

Martin, D. C., Lorton, M., Blanc, R. A., & Evans, C. (1977). *The learning center: A comprehensive model for colleges and universities*. Aquinas College. Grand Rapids, MI. (ERIC Document Reproduction Service No. ED162294)
Intended for use by educators responsible for developing post-secondary learning centers, this manual emphasizes the design and administration of such centers rather than the various aspects of skill instruction. Its seven chapters discuss the concept of a learning center; the components of the model, including Supplemental Instruction, recruitment and selection of staff, the training of tutorial and teacher assistants, learning materials, distinct labs, noncredit readiness in content areas, and extension of the model; diagnosis of institutional and individual needs; instructional methodology, specifically listening, note taking, study skills, vocabulary, and comprehension; affective consideration, with a discussion of a "relaxation" project; evaluation, including sample data and forms; and proposal preparation.

Martin, D. C., & Wilcox, F. K. (1996). Supplemental Instruction: Helping students to help each other. In G. Wisker & S. Brown (Eds.), *Enabling student learning: Systems and strategies* (pp. 97-101). Birmingham, England: Kogan Page Publishers and the Staff

and Educational Developmental Association (SEDA).(ERIC Document Reproduction Service No. ED396611).
This chapter reviews the development of the Supplemental Instruction (SI) model in the United States and its recent introduction into the United Kingdom. Several additions were made to the SI model with its use in the United Kingdom. Due to scheduling conflicts for SI leaders, it is necessary to provide several SI leaders in each course. An advantage of this decision is that the SI program provides more professional development opportunities for the SI leaders. Another feature of the SI program in the UK is the common practice of the SI leader providing feedback to the course professor and the course tutor concerning student comprehension of the lecture material. The authors emphasize the need for academic support and learning enrichment for all students in higher education.

Mason, D., & Verdel, E. (2001). Gateway to success for at-risk students in a large-group introductory chemistry class. *Journal of Chemical Education, 78*(2), 252-255.
This study examined students enrolled at The University of Texas at San Antonio regarding the impact of a special program for at-risk students enrolled in a chemistry course with no laboratory component. Supplemental Instruction (SI) was one part of this special program. The study was carefully controlled regarding the possible impact of variables. At-risk students were enrolled in both a large lecture class and a small one. The results were mixed and the authors postulate on the possible advantages of the heterogenous large course with students of varying academic abilities who interacted with the at-risk students and the more homogeneous small class with only at-risk students enrolled.

Matthews, S., Liparato, S., Shah, P., Smigell, E., Smith, T., & Schmidt, T. (1993). Supplemental Instruction and biology. *Supplemental Instruction Update*, 1, 3.
The article describes the use of Supplemental Instruction (SI) in biology at Wayne State University (Detroit, MI). The authors selected biology for several reasons: large lecture sections; lecture-focused course; fast-moving lectures; problem-solving approach; focus on interrelatedness of content material; and relationships between of ideas and concepts. Common SI session activities included: finding connections between classroom lectures and textbook; developing charts and graphs to organize and visualize information and demonstrate relationships; moving away from just memorizing content to deeper discussions of meaning and relationships.

Maxwell, M. (1979). Overcoming problems of learning services. In M. Maxwell (Ed.), *Improving student learning skills* (pp. 158-160). San Francisco: Jossey-Bass
The author provides an overview of the Supplemental Instruction (SI) program. Deanna Martin, creator of the SI model, is quoted regarding the relationship between the faculty member and the SI program. The SI leader can serve as a feedback mechanism for the course professor regarding the comprehension level of the students if invited to do so. This provides an opportunity for the course professor to review or clarify lecture content at the next class meeting. Martin urges caution not to use the SI program as a tool by administrators to change teacher behavior or the bond of cooperation between the SI program and the professor may be placed at risk.

Maxwell, M. (1987). Improving student learning skills: An update. *Journal of Educational Opportunity, 3*(1), 1-9.
In an overview of strategies for students to employ in developing their learning skills, the author provides a short overview of the Supplemental Instruction (SI) program. SI is an example of a program that rather than being student-oriented is instead content-oriented and/or process-oriented.

Maxwell, M. (1990). Does tutoring help? A look at the literature. *Review of Research in Developmental Education, 7*(4), 1-5.
The author reviews the research on tutoring and examines the problems of doing research in this area. Research studies generally are unable to show that individual tutoring, by itself, leads to higher grades for developmental students. Some studies suggest tutoring is beneficial for high ability students. Supplemental Instruction is cited as an approach that research suggests does improve student academic achievement.

Maxwell, M. (1992). Cost effective alternatives to tutoring. *Journal of Learning Improvement, 1*(1), 1-4.
The author reviews several academic support programs that serve as alternatives to traditional tutoring since there is very little evidence that generally peer tutoring directly affects the student's grades. The article provides an overview of Supplemental Instruction (SI) and adjunct courses. The article reports on a 1986 data study that examined the use of SI at a geographically diverse collection of 35 institutions that had offered SI to 4,276 students in 154 classes of a variety of academic disciplines. The data suggests SI has a positive impact upon raising final course grades (2.44 vs. 1.78) and reducing D, F and course withdrawal rates (20% vs. 35%) and higher graduation rates within six years for SI participants (30.6% vs. 18.2%). It is suggested that part of the reason for SI's positive impact is that there is immediate transfer of the study strategies to course content.

Maxwell, M. (1993). Evaluating course-related learning programs (Supplemental Instruction, adjunct skills courses and the College Restoration Program). In M. Maxwell (Ed.), *Evaluating academic skills programs: A source book* (pp. 5-1 to 5-12, A15-11 to A15-16). Kensington, MD: M. M. Associates
The author provides a basic overview of the Supplemental Instruction (SI) model, a summary of research, and references to other SI publications. The appendix provides samples of SI participant questionnaires, suggested time lines of SI program activities, criteria for evaluating SI programs, and instruments for evaluation

Maxwell, M. (Ed.). (1997). *Improving student learning skills: A new edition*. Clearwater, FL: H&H Publishing
Supplemental Instruction and Video-based Supplemental Instruction are described in several sections of this comprehensive book on developmental education and learning assistance programs. Short selections are contained in Chapter 7, successful programs and strategies for teaching high-risk college students and Chapter 12, increasing science skills.

Maxwell, M. (1997). Successful programs and strategies for teaching high-risk college students. In M. Maxwell (Ed.), *Improving student learning skills* (2nd ed., pp. 158-178). Clearwater, FL: H&H Publishing
This chapter provides an overview of the Supplemental Instruction (SI) program and Video-based Supplemental Instruction (VSI) program on pages 169 to 172. A case study of SI at California State University at Long Beach indicated that the program was modified due to financial funding problems to turn SI into an adjunct course bearing one unit of non-baccalaureate credit toward financial aid and other full-time enrollment obligations. Academically disadvantaged students (e.g., TRIO or Equal Opportunity Program students) attend SI at higher rates due to this higher level of commitment. Grades are based on a credit/no credit basis. Comparing performance of students with their own peer group reveals that underprepared students usually benefit more from SI that traditional students.

Maxwell, M. (1997). *What are the functions of a college learning assistance center?* : (ERIC Document Reproduction Service No. ED413031).
To be effective, college learning assistance centers (LACs) must reflect the mission and goals of the institution and be coordinated with existing programs and services. Based on the professional literature, LACs engage in fourteen major functions. One of them is providing Supplemental Instruction (SI) for academic support and enrichment in historically-difficult courses. Although most SI programs are voluntary and offer no credit, there are exceptions. At California State University at Long Beach the Learning Assistance Center offers 20 to 30 SI classes in different academic subjects each term. These students can earn one academic credit for attending weekly SI sessions and completing other course requirements.

Maxwell, W. E. (1998). Supplemental Instruction, learning communities, and studying together. *Community College Review, 26*(2), 1-18.
This study was designed to investigate the extent to which peer relations increased among students who participated in a modified program of Supplemental Instruction (SI) at a large community college in California. SI was modified by using instructors from the regular courses and, to a lesser extent, by financial aid counselors. Only financial aid recipients from 19 courses were invited to attend voluntary SI sessions. This allowed the study to more clearly study the impact of SI with low-income students. SI participants received a $100 grant if they attended weekly for the 16 week academic term (only 22% of SI participants earned the grant). Research suggests that the SI workshops promoted the growth of student study networks. At least 20% to 25% more of the SI students reported studying with other students and joining a study group outside of class.

McCarthy, A., Smuts, B., & Cosser, M. (1997). Assessing the effectiveness of Supplemental Instruction: A critique and a case study. *Studies in Higher Education, 22*(2), 221-231.
This article argues that methods of assessing effectiveness of Supplemental Instruction (SI) have been inadequate. The authors suggest ways of isolating SI effects on student

achievement, and recommends broadening research methods to include qualitative forms of assessment and use of multivariate linear regression analysis of quantitative data. The article concludes with a case study at the University of Witwatersrand, Johannesburg, South Africa that suggests that SI is highly effective in raising academic achievement of students from both low and high previous levels of academic performance. It may be that the authors' concerns are based on an unclear understanding of the differences between the educational systems in South Africa and the U.S. and how student variables are used in data analysis. Also, a more complete review of current published SI research methodology would reveal that many of their suggestions regarding qualitative and quantitative research methodology have already been implemented.

McCormick, J. (1983). Writing lab adaptions of Supplemental Instruction. In D. C. Martin (Ed.), *Supplemental Instruction: A model for student academic support* (pp. 87-93). Kansas City, MO: The University of Missouri-Kansas City and the ACT National Center for the Advancement of Educational Practices
The author describes how the Supplemental Instruction (SI) was customized for use within the University of Missouri-Kansas City's writing laboratory. Since students in the group are enrolled in the same content course (e.g., American history), all have a common experience and see direct application of their writing skills since the discussions are not in isolation from the content course for which the writing assignment is due. This increases student motivation and aids in the transfer effect to other content courses. Peer review and mutual responsibility for critiquing each other's work encourages collaboration.

McDaniel, A. (2008). Recruiting and training Supplemental Instruction leaders. In M. E. Stone & G. Jacobs (Eds.), *Supplemental Instruction: Improving first-year student success in high-risk courses* (Monograph No. 7, 3rd ed., pp. 39-56). Columbia, SC: University of South Carolina, National Resource Center for the First-Year Experience & Students in Transition
This chapter focuses on the recruitment and training of Supplemental Instruction (SI) leaders. Topics in this chapter include: establishing the SI leader qualifications; strategies for recruitment of SI leaders; using a three-phase process to interview SI leader applicants; extensive training of the SI leaders both before and during the academic term; observing and mentoring SI leaders during the academic term; and ongoing training and mentoring.

McGee, J. V. (2005). *Cognitive, demographic, and motivational factors as indicators of help-seeking in Supplemental Instruction.* (Ph.D. dissertation), Texas A & M University, College Station, TX. Retrieved from http://repository.tamu.edu/bitstream/handle/1969.1/2325/etd-tamu-2005A-EDAD-McGee.pd?sequence=1
The purpose of this study was to determine how cognitive, demographic, and motivational factors can be used to understand help-seeking behavior in college students. Specifically, the study examined engagement in Supplemental Instruction (SI) of undergraduate students at Texas A&M University. An additional purpose of the study

was to determine the efficacy of SI. The sample for the study was 2,407 undergraduate students who were enrolled in eight randomly selected courses at Texas A&M University in the spring 2004 semester. Students enrolled in multiple course sections were eliminated from the study. The revised sample consisted of 2,297 students. Data collected for all students in the sample included student demographic information, SI attendance and participation, and final course grades. Students were also requested to complete an on-line survey instrument containing a modified version of the Motivated Strategies for Learning Questionnaire (MSLQ) and questions related to parent education and household income. Ultimately, 1,003 students from the revised sample submitted surveys for a response rate of 43.7%. Based on attendance data and participation ratings, students were classified into three engagement groups for subsequent data analysis: high engagement, low engagement, and non-SI. The following were among the major findings from the study: Hispanic students were significantly more engaged in SI than their White peers. Engagement in SI was inversely related to grade level classification. SI participants had significantly lower mean SAT math and verbal scores than students who did not attend SI. The motivational variables as a set had a statistically significant relationship with SI engagement. Extrinsic motivation, organization, academic self-efficacy, control beliefs, help-seeking, and peer learning were the motivational scales which best predicted SI engagement. Students who were highly engaged in SI had significantly higher mean final course grades than either non-participants or low engagement students even controlling for differences in SAT scores, cumulative grade point average, and motivation. The study helps provide some insight into the dynamics of academic help-seeking. It also contributes to the growing body of evidence which shows that SI is an effective intervention for improving student success in traditionally difficult courses.

McGinty, D. A. (1990). A path analysis of the effects of multiple programs on student persistence: dormitory residence, orientation, tutoring, Supplemental Instruction [Dissertation, The University of Texas at Austin, 1989]. *Dissertation Abstracts International, 51*(02), 368A. (University Microfilms No. 9016936).
The models of Spady and Tinto depict student dropout as the result of an inadequate integration into the social and academic systems of the college. This doctoral dissertation research study hypothesizes that persistence for the traditional freshman at a large university is based on background characteristics (gender, ethnicity, rank in high school, aptitude, and college enrolled in) and variables of the academic environment (tutoring, Supplemental Instruction, student orientation, living in residence hall, and grade point average). The model hypothesizes that the academic environment variables have important direct and indirect effects. These four academic programs are described in the literature as promoting student retention. This dissertation researched the effect each program has on student persistence as well as the effect of participation in multiple programs. Path analysis was selected to explain the interactive process of the variables. Multiple regression analysis was used to investigate the strength and direction of the relationships in the path model. It is postulated that the impact of the SI program may have been diminished due to the low number of SI participants (55 of the 560 students in the overall study) which may have clouded results during data analysis. There were moderately significant differences for residence hall, Supplemental

Instruction, and the combined effects of orientation and dorm and GPA. SI participants with lower SAT scores performed at academic levels similar to non-SI participants who had higher SAT scores. Further exploratory analyses indicate that the different retention programs have varying effects on students based on ability and past performance levels. The results suggest that retention programs should be targeted at specific populations based on ability and past performance levels.

McGlone, F. D. (1994). *A training and implementation program for first year student peer mentors*. Unpublished manuscript. Queensland University of Technology. Brisbane, Queensland, Australia.
The Queensland University of Technology (QUT) Faculty of Law (Brisbane, Australia) Supplemental Instruction (SI) program encouraged students to: develop deep approaches to learning, develop generic learning skills, and increase student autonomy while encouraging them to work and learn cooperatively with others. The SI program operates in two classes: Torts and Contracts with class sizes exceeding 350. In addition to improving academic performance of student participants, the SI leaders reported enhanced communication and interpersonal skills which they perceived to increase their job marketability.

McGlone, F. D. (1995). *The integration of the principles of Supplemental Instruction in undergraduate law subjects.* Conference Proceedings of the Inaugural Pacific Rim First-Year Experience Conference, Brisbane, Australia.
This paper describes the use of Supplemental Instruction (SI) at two classes in Australia's Queensland University of Technology Faculty of Law. SI was contextualized for use within the law curriculum as was described as a Student Peer Mentor (SPM) program. The program concentrated on improving qualitative learning outcomes for the students: promote student use of deep approaches to learning, develop generic lifelong learning skills, and increase student autonomy while encouraging them to work and learn cooperatively with their peers. Several unique features of SPM are identified: selected classes are not historically difficult, the class instructor and the SPM supervisor are the same person, and that the class has always provided a one hour staff-led small group seminar for each two hours of lecture. Other than those previously noted , many common features are shared by SI and SPM.

McGlone, F. D. (1996). Student peer mentors: A teaching and learning strategy designed to promote cooperative approaches to learning and the development of lifelong learning skills. *Queensland University of Technology Law Journal, 12*, 201-220.
This paper describes the use of Supplemental Instruction (SI) at two classes in Australia's Queensland University of Technology Faculty of Law. SI was contextualized for use within the law curriculum as was described as a Student Peer Mentor (SPM) program. The program concentrated on improving qualitative learning outcomes for the students: promote student use of deep approaches to learning, develop generic lifelong learning skills, and increase student autonomy while encouraging them to work and learn cooperatively with their peers. Several unique features of SPM are identified: selected classes are not historically difficult, the class instructor and the SPM supervisor are the same person, and that the class has always provided a one hour staff-led small

group seminar for each two hours of lecture. Other than those previously noted , many common features are shared by SI and SPM.

McGrath, E. T. (1988). *Supplemental Instruction: A study of its efficacy on the Greenville College campus.* (Master's of Arts thesis), Greenville College, Greenville, IL.
The purpose of this master's thesis study from Fall 1986 and Spring 1987 was to evaluate the effects of Supplemental Instruction at Greenville College (IL) regarding: 1) mastery of course content (SI participants earned a higher final course grade -- 3.16 vs. 2.66 -- and a lower rate of D, F and withdrawal final course grades than nonparticipants (ratio of 3:4); 2) transference of learning skills from one course to another (former SI participants received a higher cum GPA in succeeding academic terms than nonparticipants, 3.14 vs. 2.66); and 3) higher course and institutional retention rates (97 percent for SI participants vs. 83 percent for nonparticipants).

McGraw, S. P., & Newkirk, S. L. (1995). Adaptation of Supplemental Instruction with mentoring support at Anne Arundel Community College. In S. P. McGraw & S. L. Newkirk (Eds.), *Fund for the Improvement of Postsecondary Education Program Book*. Washington, D.C.: Fund for the Improvement of Postsecondary Education, U.S. Department of Education
This chapter describes how Rosemary Wolfe, FIPSE Project Director for Supplemental Instruction (SI) with Mentoring Support, will be working with Ashland Community College in Kentucky to adapt the SI program for underprepared students enrolled in required general education courses; Daytona Community College to adapt the program to math courses and the peer review process; Dutchess Community College to adapt the program to lab courses; and Community College of Philadelphia to adapt the program to student success in difficult courses. Expected outcomes for faculty include increased interactive teaching skills and the development of new teaching approaches, an awareness of their teaching styles and an understanding of students' needs.

McGraw, S. P., & Newkirk, S. L. (1996). Disseminating proven reforms: Supplemental Instruction with mentoring support at Anne Arundel Community College. In S. P. McGraw & S. L. Newkirk (Eds.), *Fund for the Improvement of Postsecondary Education Program Book*. Washington, D.C.: Fund for the Improvement of Postsecondary Education, U.S. Department of Education
This chapter describes how Rosemary Wolfe, FIPSE Project Director for Supplemental Instruction (SI) with Mentoring Support, worked Ashland Community College in Kentucky, Daytona Community College, Dutchess Community College, and the Community College of Philadelphia. Expected outcomes for faculty include increased interactive teaching skills and the development of new teaching approaches, an awareness of their teaching styles and an understanding of students' needs.

McGuire, S. Y. (2006). The impact of Supplemental Instruction on teaching students how to learn. In M. E. Stone & G. Jacobs (Eds.), *Supplemental Instruction: New visions for empowering student learning* (pp. 3-10). New Directions for Teaching and Learning, No. 106. San Francisco: Jossey-Bass

This chapter describes the characteristics of today's student population, looks at the learning theories on which the Supplemental Instruction (SI) model is based, and provides an overview of the benefits of and challenges to implementing SI in the 21st century.

McKenzie, J., Alexander, S., Harper, C., & Anderson, S. (2005). Case studies: Projects and innovations which have been successfully adopted and adapted across contexts, Supplemental Instruction. In J. McKenzie, S. Alexander, C. Harper & S. Anderson (Eds.), *Dissemination, adoption, and adaptation of project innovations in higher education: A report for the Carrick Institute for Learning and Teaching in Higher Education* (pp. 34-42). Sydney, Australia: University of Technology Sydney.Retrieved from http://hdl.handle.net/10453/12236.
At University of Wollongong, it is a part of the university's officially adopted suite of systems for improving student learning and receives full-time support through funding and the presence of an officially trained and full-time SI co-ordinator. Its implementation is very widespread and centrally managed. PASS now operates in an average of five faculties per semester, including Informatics, Commerce, Engineering and Education and Health and Behavioral Sciences, and is in its fourth year of operation. Importantly, UOW maintains regular contact with the International Centre at UMKC, and have an established relationship with the new director and other staff members. This relationship has been recently formalized by the selection of their PASS Program Manager as the official Certified National Trainer for PASS/SI in Australia. At Queensland University of Technology, PASS/SI is also an established program and it is this institution which has the longest history of using Supplemental Instruction in Australia. Professor Ron Gardiner, then the Associate Pro Vice-Chancellor (Academic) pioneered the program at QUT in 1992 after hearing about the SI program at a conference (Kelly & Gardiner, 1994). Henry Loh (lecturer) then started using the SI program for his subject, Anatomy in the School of Life Sciences in 1992 and received CAUT funding. Professor Gardiner was previously the SI/PASS Program Coordinator at QUT as well as being a certified National Trainer, and he was heavily involved in championing the program more broadly. This role continued after his retirement, when he delivered a three day workshop at UOW, at the request of staff who were interested in the concept prior to its establishment at that university. It is widely acknowledged that throughout the 90's, QUT had a very large and established SI program operating, and it is still perceived as having a strong tradition of embedding SI/PASS. However, while SI is still supported in some specific faculties by teaching support staff7, in more recent years it has tended to operate in individual disciplines through the support of enthusiastic faculty members who perceive that the program is addressing particular problems they have identified in their teaching and learning, rather than being a systematic or university wide initiative. Overall the program is perceived to be less visible and systematically supported by the university by individuals both within and outside the institution. The perception being that the SI scheme is sustained 'because of the commitment of the individuals' and the perception that it is consistent with their own existing teaching principles, rather than fitting in with the university's strategic directions or agenda. At the same time, however, some of these localized adaptations of SI are recognized and perceived by other adopters as being exemplars of good-practice in the area, particularly in relation to how

strongly SI is embedded within the discipline: Martin Murray has got it very strongly embedded … I maintain a strong interest in what he does, and he has obviously done an excellent job with it. (Sally Rogan) Interestingly, in both case-studies, SI has been successful in terms of both the outcomes achieved for student-learning and its sustainability, but through the application of relatively divergent models of implementation and use.

McManus, S. M. (1992). *The relationship between Supplemental Instruction and student achievement in university mathematics courses.* (Master's of Science thesis), North Carolina State University at Raleigh, Raleigh, NC.
The relationship between Supplemental Instruction (SI) and student achievement during Fall 1990 at North Carolina State University at Raleigh (NCSU) was the focus of this study. The target population was 198 freshmen and sophomore students enrolled in entry-level mathematics courses at NCSU. During the academic term, 60 students attended one or more times (SI group) while 138 students chose not to attend any SI sessions (non-SI group). Students were enrolled in two sections of Math 241, a second-semester calculus course that was taught by the same professor. The initial section of the paper provides a review of the professional literature concerning SI. The author traces the importance of the following in understanding the unique method of SI: Piaget's constructivism, cooperative learning, student questioning skills, and study strategies. A Pearson Product Moment correlation ($r = -.1771$) and a Multiple Regression Analysis found no significant relationship between the number of SI sessions attended and final course grade. However, students who attended 5 or more SI sessions steadily increased throughout the academic term while the scores of other SI participants fluctuated. The researcher postulates that this suggests the beneficial effect of frequent SI attendance for improving academic performance. A t-test used found that students attending the SI sessions received statistically significantly higher final course grades than those who did not attend (mean final course grade: 86.44 vs. 77.62; $t = 2.95$, $df = 194$, $p < .01$). Following is a comparison between the SI and non-SI groups for each of the course exams. In each comparison the SI group earned higher mean grades: test 1: 76.41 vs. 71.92; test 2: 83.57 vs. 77.01; test 3: 87.57 vs. 79.06; test 4: 83.24 vs. 70.87; test 5: 86.12 vs. 78.82; final exam: 75.31 vs. 67.33; final course grade: 86.45 vs. 77.62. Each comparison was statistically significant except for test 1.

McMichale, E. (1994, 1994, November 29). 'Natural teachers': Tutors work alongside students in "K' program, *Kalamazoo Gazette,* p. C1.
This newspaper article describes the use of Supplemental Instruction (SI) at Western Michigan University located in Kalamazoo, Michigan.

McMillin, J. (1983). Adapting Supplemental Instruction to English composition classes. In D. C. Martin (Ed.), *Supplemental Instruction: A model for student academic support* (pp. 95-100). Kansas City, MO: The University of Missouri-Kansas City and The ACT National Center for the Advancement of Educational Practices
This chapter describes the customization of the Supplemental Instruction model for use in English composition classes at Point Loma College (CA). The author emphasized

the following elements of SI with use in the composition classes: discovery of learning in a non-threatening environment; a focus on developing a "co-worker" relationship between the SI leader and students; an awareness of process as well as content in teaching and learning; importance of reasoning skills in developing writing competency; and the role of the student as a responsible agent in his/her own educational process. This chapter provides a simulated conversation of an editing session between the SI leader and the student to illustrate the above elements.

McMillin, J. (1992). Adapting Supplemental Instruction to English composition classes. In D. C. Martin & D. Arendale (Eds.), *Supplemental Instruction: Improving first-year student success in high-risk courses* (2nd ed., pp. 34-37). Columbia, SC: National Resource Center for The Freshman Year Experience and Students in Transition.(ERIC Document Reproduction Service No. ED354839). Retrieved from https://netfiles.umn.edu/users/arend011/www/peer/SIFYEmonograph.pdf.
This chapter, initially published in 1983, describes the customization of the Supplemental Instruction model for use in English composition classes. The author emphasized the following elements of SI with use in the composition classes: discovery of learning in a non-threatening environment; a focus on developing a "co-worker" relationship between the SI leader and students; an awareness of process as well as content in teaching and learning; importance of reasoning skills in developing writing competency; and the role of the student as a responsible agent in his/her own educational process. This chapter provides a simulated conversation of an editing session between the SI leader and the student to illustrate the above elements.

Meikle, J. (1993, 1993, February 16). Learning to help others, *Guardian Education Newspaper,* p. 10.
This newspaper article describes the use of Supplemental Instruction (SI) at Kingston University in the United Kingdom. In an interview with Jenni Wallace, SI Certified Trainer for the United Kingdom, she explains that SI sessions are positioned between the classroom lectures by the professor and the tutorial sessions. The SI sessions help students to be better prepared to maximize their time spent in the tutorial sessions. There are reports that former SI leaders and participants in succeeding academic terms form their own study groups in classes where formal SI sessions are not offered. Former SI leaders report that potential employers are impressed with the skills that they developed as facilitators of the study groups.

Merriwether, V. E. (1999). *Managing an expanding program or "SI empire".* Conference Proceedings of the First National Conference on Supplemental Instruction and Video-based Supplemental Instruction, Kansas City, MO.
The author discusses strategies in managing a large SI program, or a program that is expanding with very limited staff available to deal with the day to day activities of supervising SI leaders, as well as administrative duties.

Merwin, D. D. (1991). A comparative analysis of two tutoring methods assessing student achievement and retention [Dissertation, Montana State University, 1990]. *Dissertation Abstracts International, 52*(02), 438A. (University Microfilms No. 9109700).

The purpose of this doctoral dissertation research study was to compare the effectiveness of two tutoring methods with regard to achievement and retention for high-risk undergraduate students at Northern Montana College (Havre, MT) enrolled in English 150 during the 1986-87 academic school year (eleven courses sections over the fall, winter and spring academic terms). Supplemental Instruction (SI) was compared with another form of tutoring. English 150 is a three-credit course considered to be developmental in content since it encompassed the basic skills areas (sentence structure, parts of speech, grammar, usage, punctuation, and paragraph development). The two tutoring methods were group tutoring (i.e., Supplemental Instruction, or SI) and individual tutoring. The treatment was randomly assigned to each of the eleven course sections and attendance was mandatory by the students. The problem was investigated by: (1) examining how the tutoring methods and other independent variables affected student achievement and student retention, and (2) comparing the two tutoring methods in terms of cost effectiveness. Achievement was measured by the pretest-posttest gain score from the Tests of Adult Basic Education (TABE). The TABE test for English measured students' competency in capitalization, punctuation, expression, and spelling. Retention was measured by the ratio percentage of the number of student credit hours earned compared to the number of hours attempted for the first and second years following treatment. The cost effectiveness of both tutoring methods was compared by determining the cost of one grade level of improvement. Some of the major findings were: students in SI tutoring had higher retention rates than students receiving individual tutoring for the first and second years following treatment; the combined results of the two tutoring methods did make a significant difference in student achievement; the SI tutoring method compared to the individual tutoring method was more cost effective ($3.46 average cost for SI program to improve one grade level of one students vs. $16.30 for one-on-one tutoring to do the same); and individual tutoring had a relatively short-term effect. An unexpected finding was that students who participated in SI groups continued to meet at other times outside of class and that the groups were heterogeneous groupings. Interviews with these students revealed that they had met the other students through the SI sessions. It was assumed that students would tend to meet with their own homogeneous affinity groups. The SI students revealed that they enjoyed the social interactions in the groups and felt more comfortable working with other SI participants when they needed additional academic assistance with the English 150 course. The SI program also had an impact upon the SI leaders. Three of the seven SI leaders changed their degrees -- two were business majors and one was a vocational-technical major -- to education so they could become professional teachers. One-on-one tutors reported frustration with the tutoring program when students canceled their scheduled tutoring sessions. Since SI leaders worked with groups, they did not encounter that problem.

Metcalf, K. J. (1996). The impact of the training format on tutors' attitudes, beliefs, values, and practices in college level tutoring [Dissertation, State University of New York at Buffalo, 1996]. *Dissertation Abstracts International, 57*(09), 3780A.
There is a lack of empirical data to support which, of several training formats (models), is the best format for training tutors. The purpose of this present dissertation study was to identify which of four training formats produced a positive chance in tutor's attitudes

towards tutoring, the tutoring process, and its administration. Accredited Course (AC), Supplemental Instruction Liaison (SIL) Course, Comprehensive Course (CC), and Short Course (SC).A dual methodology was used. In the quantitative study, data was gathered from student-tutors in 30 postsecondary tutor training programs, using a pre and post-test quasi-experimental research design. The College Student Peer-Tutor Survey (CSPTS) was developed to assess whether length or amount of tutor training influenced a positive change in student-tutors' attitudes toward tutoring. The qualitative component of the overall study sought to capture the insights and perceptions of the tutor coordinators/trainers from the 30 tutor training programs in relation to: (a) understanding the programs' organization and instructional content, (b) refining the typology of formats, and (c) developing recurrent themes. As a result of training and experience tutoring, statistically significant changes in tutor's attitudes towards tutoring were evidenced in all four formats. SIL tutors showed more positive change in relation to the importance of "A tutor being an expert in the subject area he/she is tutoring in." Results from the qualitative component of the study focused attention on three recurrent themes: (a) the need for further refinement of the typology of formats, (b) the need for staff development, and (c) the precariousness of program status.

Miles, C. A., Polovina-Vukovic, D., Littlejohn, D., & Marini, A. (2010). *The effectiveness of Peer-Assisted Study Sessions (PASS} Program in enhancing student academic success at Carleton University*. Unpublished manuscript. Toronto. Retrieved from http://www.heqco.ca/SiteCollectionDocuments/Carleton%20PASS%20ENG.pdf
Carleton University introduced the Peer-Assisted Study Session (PASS) program to assist students who are registered in traditionally difficult or high attrition courses, with combined D, Fail or Withdrawal (WFD) rates of over 30 per cent, to succeed in their courses. The PASS program was first piloted at Carleton University in 2000, when support was provided through the Centre for Initiatives in Education (CIE) for one first-year psychology course. Currently administered by the Student Academic Success Centre (SASC), Carleton's PASS program has expanded greatly, with PASS support being provided for over 50 courses in a number of different faculties. The study sessions are offered and led by student facilitators who have already successfully completed the same course and receive additional training. The sessions offer students an opportunity to come together in an informal environment, where they are encouraged to compare class notes, discuss course concepts, develop strategies for studying and learning the course material, and predict test items. The researchers found that PASS significantly improved academic success among those students who took advantage of the opportunity. Students who attended PASS achieved higher final grades, on average, than students who did not attend, and the DFW rates were significantly lower among PASS participants than non-PASS participants.

Millard, M. (1995, 1995, October 19). First African-American to hold post: New Chancellor at City College helps win $1.67 million grant, *The Sun Reporter,* p. 1.
This newspaper article describes how Del Anderson, the new Chancellor of San Francisco City College (CA), will use a $1.67 Title III grant from USDOE to help students in "high risk" courses and to bring the Internet into the classroom. The chancellor, formerly president of San Jose City College, mentioned that she had

developed many programs for students of color to help them achieve higher transfer and graduation rates.

Miller, C. J. M., & Packham, G. A. (1999). Peer-Assisted Student Support at the University of Glamorgan: Innovating the learning process? *Mentoring & Tutoring, 7*(1), 81-95.
Peer-Assisted Student Support (PASS) is based upon Supplemental Instruction (SI) and is the predominate name used in the United Kingdom. This article provides an overview of PASS. This article describes the use of PASS at the University of Glamorgan Business School. Comparisons were made between participants and nonparticipants regarding achievement on unit exams. The results favored the participants.

Miller, D. A. (2006). *Helping students understand technical calculus via an online learning supplement and group learning*. Unpublished manuscript. West Virginia University. Morgantown, WA. Retrieved from http://math.unipa.it/~grim/21_project/21_charlotte_MillerDavidPaperEdit.pdf
This report describes an adaptation of the traditional Supplemental Instruction (SI) for online learners. This experiment was for students enrolled in a technical calculus course. This version of SI was voluntary for the students. Students that participated in the study performed significantly higher than non-participants, were motivated to learn, and had a positive attitude towards calculus, their perceptions on how the discussion sessions and the online SI sessions helped them to perform better in the course. The name for this adaptation of SI was called Technical Calculus Learning Supplement (TCLS).

Miller, K. J. (1996). *Developmental education at the college level*. Bloomington, IN: Phi Delta Kappa Educational Foundation.
This monograph provides an overview of developmental education at the postsecondary level. On pages 32 and 33 a short overview of Supplemental Instruction (SI) is provided

Miller, V., Oldfield, E., & Bulmer, M. (2004). *Peer Assisted Study Sessions (PASS) in first year chemistry and statistics courses: Insights and evaluations.* Conference Proceedings of the UniServe Science Scholarly Inquiry Symposium, Sydney, Australia. Retrieved from http://science.uniserve.edu.au/pubs/procs/wshop9/schws003.pdf
Peer Assisted Study Sessions (PASS), based upon the Supplemental Instruction (SI) model, was used in first year chemistry and statistics courses at the University of Queensland in Australia. This study analyzed results from 2003 and found that PASS participants earned higher final course grades than nonparticipants. Other reported positive outcomes through qualitative research findings were higher student confidence, increased desire to continue in the academic discipline, increased in analytical and creative approach to learning, and greater sense of belonging within a community of learners.

Miner, J. (Writer). (1991). Politics of remediation [Videotape]. In J. Miner (Producer). Los Angeles, CA: DeAnza College

This video teleconference was concerned with a review of successful practices for serving academically underprepared students. Featured panelists included John Roueche and Lee Noel. An eight minute segment featured an interview with Deanna Martin, creator of the Supplemental Instruction (SI) model. Martin provided an overview of the SI program and discussed how the program can be used to serve both the best and least prepared students.

Moore, I. (1992). *Undergraduate students as assistant demonstrators in the first year physics laboratory*. Unpublished manuscript. Queensland University of Technology, School of Physics. Brisbane, Queensland, Australia.
This paper describes the use of a modified Supplemental Instruction (SI) program in the School of Physics at Queensland University of Technology (Brisbane, Australia). The pilot project used second and third year physics major students as assistant demonstrators in the first year physics laboratory. In addition to improvement by the students in the class, the assistant demonstrators also showed improvements in their class performance. Through qualitative research, it appears that the assistant demonstrators helped students to improve their own learning process, focus on the process rather than rushing to complete the task, and think of new issues and questions.

Moore, R., & DeLee, O. (2006). Supplemental Instruction and the performance of developmental education students in an introductory biology course. *Journal of College Reading & Learning, 36*(2), 9-20.
Supplemental Instruction (SI) was analyzed in an introductory biology class at the University of Minnesota with a student population of mostly academically-underprepared students. The findings favored SI participants over non-participants regarding higher final course grades. Other findings were that the SI participants attended class more often, took more advantage of instructor's office hours, and handed in more extra-credit homework. The authors suggest that SI can be especially effective for academically-underprepared students.

Mosley, A. T., Pham, D., Maize, D. F., & Lagrange, L. P. (2013). Pharmacy students' perception of a modified Supplemental Instruction program. *Currents in Pharmacy Teaching and Learning*. Retrieved from http://www.sciencedirect.com/science/article/pii/S1877129712001219.
The results of this study indicate that students who had been enrolled in the program perceived an academic benefit. Student insight on the mandatory attendance policy, the notification of and preparation for the sessions, and the negative stigma related to an academic assistance program led to changes that were incorporated into the supplemental instruction SI design and implementation. The early detection of high-risk students and immediate and ongoing interaction between these students and course faculty is perceived as a benefit and a unique aspect of our Doctor of Pharmacy program. This study introduces the development and implementation of an SI program and the findings may assist other schools of pharmacy in designing their own SI programs.

Muhr, C., & Martin, D. C. (2006). TeamSI: A resource for integrating and improving learning. In M. E. Stone & G. Jacobs (Eds.), *Supplemental Instruction: New visions for empowering student learning* (pp. 85-94). New Directions for Teaching and Learning, No. 106. San Francisco: Jossey-Bass
Based on an adaptations of the basic SI model, TeamSI presents an approach to improve both students' understanding of their professional discipline and their self-development as more mature learners and leaders. This approach is being used with medical students in Sweden.

Munoz O'Laughlin, J. (2012). *Supplemental Instruction as a remedy for the developmental mathematics university student* (Master of Arts thesis), California State University, Dominguez Hills, Dominguez Hills, CA.
Research was conducted at California State University, Dominguez Hills to determine the impact of Supplemental Instruction (SI) on underprepared first-year Educational Opportunity Program (EOP) students' successful completion of mathematics remediation. Course completion rates were tracked and a chi-square test was used to examine the relationship between the number of SI courses taken and completion of math remediation. Results indicated that EOP students who participated in the full sequence of SI courses offered completed their remediation at significantly higher rates than students who did not.participate in SI. Requiring academic support like SI for underprepared students may be an effective way for universities to increase retention rates. The researcher suggested a follow-up study could include a third group for comparison, non-EOP students who entered the university at the same lowest math levels but did not participate in SI. Another issue was understanding the influence of motivation why the EOP students decided to participate in the full sequence of SI courses and worded hard to complete the developmental math requirements.

Muraskin, L. (Ed.). (1997). *"Best practices" in Student Support Services: A study of five exemplary sites*. Washington, D.C.: U.S. Department of Education.(ERIC Document Reproduction Service ED416784)
This report examines "best practices" in the delivery of Student Support Services (SSS), one of the Special Programs for Disadvantaged Students collectively known as the TRIO programs. The study is based on case studies that were conducted in five local SSS projects during early 1996. The five projects were drawn from 30 projects in the National Study of Student Support Services, a longitudinal survey of students begun in 1991. A common theme of academic support at all five institutions was with providing learning assistance for developmental and popular freshman courses. Two of the five sites used Supplemental Instruction (SI) as an integral part of academic enrichment for SSS students. Another site used a variation of SI.

Murray, L. (1997, 1997, October 24). New program relies on peer instruction, *The Daily Reveille (Louisiana State University School Newspaper),* p. 7.
This newspaper article provides a basic overview of the Supplemental Instruction (SI) model. SI will be implemented on the Louisiana State University campus in Spring 1998.

Murray, M. H. (1995). *Report on Peer Assisted Study Sessions in Engineering Mechanics 2*. Unpublished manuscript. Queensland University of Technology. Brisbane, Queensland, Australia.
This report discusses the use of Peer Assisted Study Sessions (PASS), the local institutional term for the Supplemental Instruction (SI) program used at Queensland University of Technology (Brisbane, Queensland, Australia) in CEB185, Engineering Mechanics 2. PASS participants earned higher mean final course grades (3.6 vs. 2.8 on a 0 to 7 scale). The most significant change in grades was in improving the performance of students who previously were projected to earn low grades and see them now achieve final grades in the mid range. PASS participants mentioned the following reasons for attending the sessions: working on past exam and test solutions; discussion of problems; being able to ask questions freely and not look stupid; realizing there were different ways to tackle a problem; and interaction with fellow students and leaders who had recently done well in the course.

Murray, M. H. (1996). Alternative to lecturer-centered teaching enhances student learning and costs no more. *Academic Staff Development Unit Update (Queensland University of Technology, Australia)*, 6-7.
This article describes the use of Supplemental Instruction (SI) in the School of Civil Engineering, Queensland University of Technology (Australia). A basic engineering statics course in the first year has been transformed from a traditional lecturer-centered teaching mode into a student-centered resource-based model. Central to this transformation has been the integration of SI into the course. The SI sessions focus on interaction, discussion, and investigation rather than just simple problem solving. Before integration of SI in the course the total class (SI and non-SI students) mean final score was 46, in 1996 after the integration the score increased to 55. These results are based on the aggregated score from four quizzes during the semester, from a spaghetti bridge design/build/test project, and from a final end-of-semester exam. Based on standardized scores, the students in 1996 were less academically prepared than the ones in 1994 before SI was introduced. The SI participants received a higher mean final percentile grade in each year of the study (1995: 48 vs. 41; 1996: 56 vs. 42). There was a positive increase in final course score and higher levels of SI attendance. Students evaluated the SI session most useful of all course components (SI sessions, 53%; lecture, 22%; text book, 16%; study guide, 13%; and tutorial, 9%). SI leaders mentioned the following benefits of the program for themselves: increased skill in group management; improved public speaking; gained skills in team building; increased group facilitation skills; improved personal time management; and increased interest from potential employers because of skills developed as a SI leader.

Murray, M. H. (1996). *Resources for the resourceless: Maximizing student learning.* Conference Proceedings of the 8th Conference of the Australian Association of Engineering Education, Sydney, Australia.
This article (which won "Best Paper" award at the conference) describes the use of Supplemental Instruction (SI) in the School of Civil Engineering, Queensland University of Technology (Australia). A basic engineering statics course in the first year has been transformed from a traditional lecturer-centered teaching mode into a student-centered

resource-based model. Central to this transformation has been the integration of SI into the course. The SI sessions focus on interaction, discussion, and investigation rather than just simple problem solving. Before integration of SI in the course the total class (SI and non-SI students) mean final score was 46, in 1996 after the integration the score increased to 55. These results are based on the aggregated score from four quizzes during the semester, from a spaghetti bridge design/build/test project, and from a final end-of-semester exam. Based on standardized scores, the students in 1996 were less academically prepared than the ones in 1994 before SI was introduced. The SI participants received a higher mean final percentile grade in each year of the study (1995: 48 vs. 41; 1996: 56 vs. 42). There was a positive increase in final course score and higher levels of SI attendance. Students evaluated the SI session most useful of all course components (SI sessions, 53%; lecture, 22%; text book, 16%; study guide, 13%; and tutorial, 9%). SI leaders mentioned the following benefits of the program for themselves: increased skill in group management; improved public speaking; gained skills in team building; increased group facilitation skills; improved personal time management; and increased interest from potential employers because of skills developed as a SI leader.

Murray, M. H. (1997). Better learning through curricular design at a reduced cost. *Journal of the American Society of Engineering Education*, 1-5.
This paper describes the use of Supplemental Instruction (SI) in the School of Civil Engineering, at Queensland University of Technology, Australia. After an initial discussion of the changes economic and educational trends in Australia, the report reviews the use of SI with students in a first year engineering course (Engineering Mechanics 1). It is an introduction to rigid body statics, equilibrium, moments, forces, and properties of plane areas. Using the Australian system of 7 point grading (1 = lowest, 7 = highest), the data suggests that the performance of SI participants was higher than non-SI participants (1995: 3.3 vs. 2.7; 1996: 4.4 vs. 2.8). Due to the use of SI, the course was restructured with a reduction of professor lecture time. This resulted in a lower student unit cost. Before SI's introduction, the student unit cost was more than $51 in 1994 (each week 2 hours of lecture and 1 hour of tutorials) and was reduced to less than $42 in 1997 (each week one hour of lecture, one hour of tutorial, one hour of SI, study guides, computer exercises, and E-mail).

Murray, M. H. (1997). Students, learning resources: An inseparable triad. *Australian Journal of Engineering Education, 7*(2), 129-139.
This paper describes the use of Supplemental Instruction (SI) at the School of Engineering, Queensland University of Technology (Australia) with two first year engineering courses. SI is compared with the traditional, lecture-centered model of learning. The introductory engineering courses were reorganized to integrate SI into the learning delivery system. Based on the seven point grading scale employed in Australian education (1 = low; 7 = high), the academic performance of students with SI was raised to 4.3 from the previous level of 3.0 before the introduction of the SI model.

Murray, M. H. (1999). *SI down under -- Australian innovations: Funding, solutions, and analysis.* Conference Proceedings of the First National Conference on Supplemental Instruction and Video-based Supplemental Instruction, Kansas City, MO.
SI was established in Australia during the early 1990s. The author reports on the adaptations that have been made to the American SI model to meet challenges. Most Supplemental Instruction (SI) programs do not receive funding from central administration but instead have to solicit funds from separate academic units. Responses to this challenge include restructuring of courses to increase effectiveness and integration of SI along with the use of advanced SI leaders to serve as assistant SI supervisors since often the SI program receives no full-time administrative oversight but instead relies upon the individual course faculty members who offer SI in connection with their course. An unanticipated benefit of the SI program has been the professional development of the SI leaders.

Murray, M. H. (2001). Students managing to learn and teachers learning to manage. In J. E. Miller, J. E. Groccia & M. S. Miller (Eds.), *Student-assisted teaching: A guide to faculty-student teamwork* (pp. 50-55). Bolton, MA: Anker Publishing Company.Retrieved from ERIC database. (ED449713).
This chapter describes the use of Supplemental Instruction (SI) at Queensland University of Technology (QUT), an inner-city, multicampus university with 35,000 students in Australia. SI was implemented in the engineering course taught by the author. Final course scores were higher and attrition rates lower for SI participants in the 1995-96 study. The overall cost of offering the course was reduced through introduction of SI since additional part-time lecturers and tutors were replaced by the SI scheme. The author also reported benefits for the SI leaders in terms of personal and professional growth.

Murray, M. H. (2006). *PASS: Primed, persistent, pervasive.* Conference Proceedings of the National PASS Day Conference. Retrieved from http://www.uow.edu.au/content/groups/public/@web/@stsv/documents/doc/uow021512.pdf
This paper describes how the Supplemental Instruction (SI) was customized for use in Australia and named Peer Assisted Study Sessions (PASS) since the early 1990s. PASS has been used at Queensland University of Technology in Australia in a first year, first semester coure in the Bachelor of Engineering program since 1993.The course covered basic engineering mechanics. The PASS participants both enjoyed higher final course grades and dramatically lower rates of failure. The article also discusses some of the administrative issues faced with continued support for the PASS program with difficult economic challenges facing the institution. An external grant was secured from Exxon for five years to underwrite part of the program costs. The PASS program was partially led and managed by senior PASS student facilitators.

Murray, M. H., Grady, J., & Perrett, S. (1997). *Students managing students' learning*. Paper presented at the 9th Annual Conference of the Australian Association of Engineering Education.

This paper describes the use of Supplemental Instruction (SI) at Queensland University of Technology (Brisbane, Australia) in engineering classes (Engineering Mechanics I and II). Student participant comments said that participation in SI sessions: developed greater understanding, more helpful than tutorials, made discussions more enjoyable, developed greater confidence, enjoyed group work, and found the atmosphere more relaxed and helpful. SI leaders mentioned the following benefits for themselves: reinforced own learning and study skills, developed more confidence, made academic coursework more challenging and satisfying.

Ng, R., Kaur, A., Farina, S., Mohamed, S., Latif, A., & Ramli, B. (2009). E-mathematics : pre-instructional and supplement instruction and their impact of student's online participation and final exam score. . *AAOU Journal, 4*(1), 27-36. Retrieved from http://eprints.oum.edu.my/375/1/e-math_richard.pdf.
Open University Malaysia (OUM), Malaysia’s first open and distance learning with over 70.000 students, offers more than 51 programs to-date. More than 90% of its students are working adults who are unable to leave their jobs or families behind to pursue their dream of getting a degree. The blended learning approach adopted by OUM provides the flexibility for working adult’s to obtain the required paper qualification and to upgrade their knowledge. One of the important elements of blended learning is the use of online discussion forum where learning takes place beyond classroom. Mathematics, a traditionally difficult course, forms part of the prerequisite for students to obtain a business degree at OUM. The adult learners at OUM generally have left school for at least five years and most of them have low grades in Mathematics at O’ Level. Thus it is a big challenge for these adult learners to undertake a Mathematics course via online with minimum Face-to-Face contact with their tutors. This paper focuses on the implementation of pro-instruction workshop and supplemental instruction to find its impact on student’s online participation and exam results of 88 students. The contents of the online forum were also analyzed using a 34-item instrument derived from the Community of Inquiry model. Results obtained showed that there was a strong correlation between workshop participation and final exam score. Independent samples t-test conducted showed that there was a significant difference between the mean score of online
discussion ratio and final examination between participants attached to a tutor conducting the workshop and extended coaching compared to participants attached to another tutor using the normal teaching guide. The means COI score obtained for mathematics between the two tutors indicated that there is a difference in the teaching and cognitive presence but almost similar in the social presence.

Ng., R., Kaur, A., & Latifah, A. L. (2009). *Online Supplemental Instruction: An alternative model for the learning of mathematics. .* Conference Proceedings of the International Conference on Information,, Kuala Lumpur, Malaysia. Retrieved from http://eprints.oum.edu.my/282/1/online_supplemental_ici9.pdf
More than 90% of Open University Malaysia (OUM)’s learners are working adults who are unable to leave their jobs or families behind to pursue their dreams of getting a degree. The blended learning mode adopted by OUM provides the flexibility for working adults to obtain their paper qualifications and to upgrade their knowledge. Mathematics,

a traditionally difficult course, forms part of the pre-requisite for learners to obtain a business degree at OUM. The adult learners at OUM generally have left school for at least five years and most of them have low grades in Mathematics at O' Level. Thus it is a big challenge for these adult learners to undertake a Mathematics course via online with minimum Face-to-Face contact with their tutors. This paper proposes an alternative model of learning mathematics known as Online Supplemental Instruction (OSI) model which involves three components; pre-tutorial workshop, online mentoring, and online video support. The research which involved 132 learners under the tutorship of two tutors was carried out to find the impact of the model on learners' online participation and final exam score. The contents of the online discussion forum were analyzed using a 34-item instrument derived from the Community of Inquiry (COI) model. Learners' online participation behavioral pattern was also analyzed. Results obtained showed that there was a strong correlation between learners who have participated in the OSI model of learning and their online participation and final exam score.

Ning, K., & Downing, K. (2010). The impact of Supplemental Instruction on learning competence and academic performance. *Studies in Higher Education, 35*(8), 921-928. Retrieved from http://www.tandfonline.com/doi/pdf/10.1080/03075070903390786.
This study investigated the effects of Supplemental Instruction, a peer-assisted learning approach, on students, learning competence and academic performance. The supplemental instruction intervention facilitated by senior students focused on developing students' use of study skills and enhancing their motivation and academic performance. Pre- and post-intervention learning competence measures (the 10 scales of the Learning and Study Strategies Inventory) were available for 430 first year undergraduate business students (Supplemental Instruction, n = 109; Non-Supplemental Instruction, n = 321) from a university in Hong Kong. Structural equation modeling demonstrated that Supplemental Instruction had a significant effect on academic performance, both directly and indirectly via enhancement of student learning competence, after controlling for pre-intervention learning strategy scores and previous academic achievement. This study provides evidence that Supplemental Instruction can be a very effective instructional strategy for promoting undergraduate student learning.

Nolting, P., & Ruble, K. (1999). *Supplemental Instruction with math study skills templates.* Conference Proceedings of the First National Conference on Supplemental Instruction and Video-based Supplemental Instruction, Kansas City, MO.
SI can be expanded to include mathematics study skills as integral content to learning math and at the same time organize the SI design designs. The authors focus on the content of math study skills and provide examples of how these specific study strategies can structure the student learning activities.

Ochae, R. (1995). Writers at risk: An experiment with Supplemental Instruction in freshman writing classrooms *Black Hills State University Research and Scholarly Work Symposium Proceedings* (pp. 67-72). Spearfish, SD: Black Hills State University.(ERIC Document Reproduction Service No. ED414830).
This book chapter describes the use of Supplemental Instruction (SI) during Fall 1994 at Black Hills State University (Spearfish, SD) with a beginning writing class (English 101).

The institution has an open admission policy and high attrition and dropout rates in the first writing course. To measure effectiveness of SI, a diagnostic essay (EDE) was administered to the English 101 students, based on a common essay prompt and scored holistically by the entire English faculty. Results suggested that SI helped SI participants to improve writing skills (gain of 15.7% on the EDE vs. 14.0% for courses taught by the same professor but without SI), earn higher mean final course grades (2.6 vs. 2.5, reduce failure rates (13.8% vs. 16.0%), and lower course withdrawal rates (6.1% vs. 6.9%).

Ochae, R. (1995). *Writing partners: Improving writing and learning through Supplemental Instruction in freshman writing classrooms*. Paper presented at the Annual Meeting of the National Council of Teachers of English, San Diego, CA. Retrieved from ERIC database. (ED395323).
A study was conducted at Black Hills State University (SD) which has an open admission policy and high attrition and dropout rates in the first writing course. Results suggested that SI helped SI participants to improve writing skills (gain of 15.7% on standardized test vs. 14.0% for courses taught by the same professor but without SI), earn higher mean final course grades (2.6 vs. 2.5, reduce failure rates (13.8% vs. 16.0%), and lower course withdrawal rates (6.1% vs. 6.9%).

O'Donnell, L. E. (1995). *Inclusion for learning disabilities: Technology with learning variables research and Supplemental Instruction.* Conference Proceedings of the Empowering children with special needs: Practices around the world, Brighton, United Kingdom.
Learning Variables Research and Supplemental Instruction (LVR/SI) provide an innovative approach to inclusion for intellectually normal and gifted students with learning disabilities. The original Supplemental Instruction (SI) model is generally used with traditional college undergraduate and graduate students. Video-based Supplemental Instruction (VSI) allows enrolled high school or college students view the videotaped lectures of a college level course (e.g., Western Civilization, General Chemistry) and allow them opportunity to control the flow of information (e.g., stop, repeat, discuss material before proceeding). SI, and especially VSI, can be very helpful for students with learning disabilities since they can be served inside the same content class rather than requiring an additional class for the students to attend to deal with their specialized learning needs. The LVR/SI approach refines either the SI or VSI model with individualized learning variables and computer technology for application in junior high, senior high, and higher education. Rather than using video tape with VSI, computer technology might be substituted. In addition, the SI leader or VSI facilitator is provided critical information about students with disabilities. This technology-based program allows individuals with learning disabilities to succeed academically in integrated, inclusive classrooms.

O'Donnell, L. E. (1996). Inclusion for learning disabilities: Technology with learning variables research and Supplemental Instruction. *International Journal of Special Education, 11*(2), 27-32.

Learning Variables Research and Supplemental Instruction (LVR/SI) provide an innovative approach to inclusion for intellectually normal and gifted students with learning disabilities. The original Supplemental Instruction (SI) model is generally used with traditional college undergraduate and graduate students. Video-based Supplemental Instruction (VSI) allows enrolled high school or college students view the videotaped lectures of a college level course (e.g., Western Civilization, General Chemistry) and allow them opportunity to control the flow of information (e.g., stop, repeat, discuss material before proceeding). SI, and especially VSI, can be very helpful for students with learning disabilities since they can be served inside the same content class rather than requiring an additional class for the students to attend to deal with their specialized learning needs. The LVR/SI approach refines either the SI or VSI model with individualized learning variables and computer technology for application in junior high, senior high, and higher education. Rather than using video tape with VSI, computer technology might be substituted. In addition, the SI leader or VSI facilitator is provided critical information about students with disabilities. This technology-based program allows individuals with learning disabilities to succeed academically in integrated, inclusive classrooms.

O'Donnell, R. (2004). *Introducing peer-assisted learning in first year accounting in Australia*. Unpublished manuscript. Department of Economics, Macquarie University. Sydney, New South Wales, Australia. Retrieved from http://www.econ.mq.edu.au/Econ_docs/research_papers2/2004_research_papers/PAL Dec04.pdf
At Macquarie University in Australia, Peer Assisted Learning (PAL) is an adaptation of the Supplemental Instruction (SI) model. PAL was piloted in an accounting course. The paper describes the pilot program regarding its design, outcomes, benefits, costs, and lessons learned. There was a positive correlation between higher grades and more frequent attendance in the PAL sessions. There were also benefits for the PAL facilitators: development of keys skills such as leadership, communication, group management; deeper understanding of course content; valuable enhancement to employability; and financial payment.

Ody, M., & Carey, W. *Demystifying Peer Assisted Study Sessions (PASS): What...? How...? Who...? Why...?* Unpublished manuscript. The University of Manchester. Manchester, U.K. Retrieved from
http://documents.manchester.ac.uk/display.aspx?DocID=7418
PASS offers benefits at several levels to various stakeholders.At an institutional level it provides an additional cost-effective method of student support, which has been highlighted as good practice by the Quality Assurance Agency in supporting the student experience. The impact of PASS on a student 's employability is also recognised by employers and professional accreditation bodies; during a recent visit to the School of Chemical Engineering and Analytical Sciences the IChemE reported positively on the use of PASS and notably its impact on the transferable skills developed by PASS Leaders. Anecdotal feedback from a range of graduate employers recognises that students who engage in voluntary roles, such as a PASS Leader, develop competencies and transferable skills that increase their employability prospects

Ody, M., & Carey, W. (2010). *Mid term evaluation and feedback on the run...* PowerPoint Presentation. University of Manchester. Manchester, U.K. Retrieved from http://documents.manchester.ac.uk/display.aspx?DocID=7416
These PowerPoint slides are from the authors presentation at the 2010 Supplemental Conference in New Orleans. Topics include the real-time evaluation system used at the University of Manchester.

O'Flaherty, K., & Siera, M. (1985). The use of Supplemental Instruction in an Introduction to Sociology course. *ASA Teaching Newsletter, 10*(6), 13-16.
At Wichita State University (KS) the Supplemental Instruction (SI) model was used to help improve student academic performance in an Introduction to Sociology course. This Spring 1984 study suggested that SI attendance was positively correlated with higher mean final course grades. Of the SI participants, 75 percent received a final course grade of A or B while 59 percent of non-SI participants received a similar grade.

Ogden, P., Thompson, D., Russell, A., & Simons, C. (2003). Supplemental Instruction: Short- and long-term impact. *Journal of Developmental Education, 26*(3), 2-4. 6, 8.
The purpose of this study was to assess Supplemental Instruction (SI) for short- and long-term impact on college academic performance and retention at Georgia State University. Data were compiled for students registered in a political science course supported by SI. Four groups were identified according to their university entry status and SI participation: traditional (regularly admitted) SI participants, conditional (Learning Support Programs and/or English as a Second Language entry status) SI participants, traditional non-SI participants, and conditional non-SI participants. All SI participants volunteered for the program. There was no statistically significant differences between SI and non-SI participants in the two comparison groups when preentry attributes were analyzed. Conditional students participating in SI had significantly higher short- and long-term outcomes compared to conditional non-SI participants. Conditional SI participants reenrolled at a higher rate than did the other three student groups included in this study. Traditional SI participants earned higher final course grades than their non-SI counterparts, though the results were not statistically significant. The ESL students were equally distributed among the four comparison groups and did not serve as a statistically significant factor in outcomes studied.

Ogilvie, C. (1991). Supplemental Instruction: The California State University model. *Illinois Association for Personalized Learning Programs Newsletter*, 4-5.
This newsletter article provides an overview of the Supplemental Instruction (SI) program at California State University. To increase attendance at the SI sessions, students are required to register for a section of one credit and pay tuition to allow attendance at the SI sessions. SI is provided to 35 sections of courses.

Oja, M. (2012). Supplemental Instruction improves grades but not persistence. *College Student Journal, 46*(2), 344-349.

Supplemental Instruction (SI) is a growing student support service used to offer students peer-guided activities to improve course learning. The current research was conducted to answer two research questions: 1) Do those who participate in SI perform better in their courses than those who do not attend SI? 2) Are those who participate in SI more likely to persist at the college for another term, than those who do not attend SI? Performance was compared for students who did or did not attend a session of SI in course sections that offered SI. Participation in SI sessions predicted term GPA (grades in all course taken that term for each student) and pass rates, above and beyond prior GPA. SI did not seem to encourage persistence at the college to the following fall term. Overall, SI is a beneficial program and should be continued and/or expanded.

Okonkwo, Z. C., & Berry, E. (2013). An examination of the study table project and student achievement at a four-year college: Ramifications for retention, progression and graduation. . *International Journal of Research in the Academic Disciplines in Higher Education, 1*(1), 13-37. Retrieved from http://www.zetrics.com/firstedition/ijrdheFE2013.pdf#page=14.
Traditionally, XYZ University had employed multifaceted approach to provide students out of class academic learning support which focused on enhancing student academic achievement, retention, progression, persistence, and graduation in their courses and programs. Over the years, retention, persistence, and graduation (RPG) have become essential attributes for gauging institutional effectiveness in the University System to which XYZ University belongs. State funding of state Colleges and Universities are partially based on these delineated attributes. Support programs included peer tutoring in a variety of courses, sometimes housed in various academic units and departments, with supplemental instruction, mostly facilitated by instructors. Supplemental Instruction (SI) targeted gatekeeper courses such as College Algebra, Precalculus with Trigonometry, Calculus I, General Chemistry I, Introduction to Biology I, and Introductory Physics I. These courses have traditionally had very high Fail, “D grade, and withdrawal (FDW). In order to improve student success rate in foundation teacher certification exams, Praxis I (PreProfessional Skills Tests) review, encompassing of the quantitative and verbal sections, was introduced, this was later replaced by a state mandated Assessments for the Certification of Educators review. These academic support programs have achieved a reasonable level of success in the past, although no comprehensive assessment report has been written regarding overall accomplishments of these interventions. Guided by the zeal to continue to improve student retention, progression, and graduation at XYZ University, the Study Table P roject was in introduced in fall of 2011. In this paper therefore, the researchers compare student achievement within two subgroups in each category: participant and nonparticipant; the categories being freshman, sophomore, junior, senior, athlete, and the learning support cohort. Furthermore, participant survey results were used to gauge participant perception of the impact of the Study Table on their achievement.

Oliver, R. (1994, 1994, July 29). University of Port Elizabeth rector on the right road, *Eastern Province Herald Newspaper,* p. 11.
This newspaper article reports on the signing of an agreement between the University of Missouri-Kansas City and the University of Port Elizabeth in South Africa concerning

Supplemental Instruction (SI). UPE is implementing the SI program to help bridge the gap caused by differences in the education systems in the country.

Oliver, S. (1995). Empowering student learning with Supplemental Instruction *Developing skill-based curricula through the disciplines: Case studies of good practice in geography, SEDA Paper 89*. Birmingham, England: Staff and Educational Development Association
This article describes the introduction of Supplemental Instruction (SI) to the United Kingdom in the 1990s. The author describes some of the issues associated with its implementation at his institution of Saint Mary's University College in London.

Orr, M. K. (2010). *Comprehensive analysis of a student-centered active-learning integrated statics and dynamics course for mechanical engineers.* (Master of Science thesis), Clemson University, South Carolina - United States.
The Student-Centered Active Learning in Undergraduate Programs (SCALE-UP) approach to instructional design was adapted with the goal of delivering more effective statics, dynamics and multivariate calculus instruction and integrated course curricula. Inquiry-based learning exercises were designed, incorporating material from statics and dynamics into multivariable calculus, and vice-versa, as well as integrating statics and dynamics into one course. Analysis included an exploration of student study habits, multiple measures of course effectiveness, and an examination of curricular effects. Challenges of implementation are also discussed. Study habits of students in an integrated Statics and Dynamics course were assessed through a voluntary survey in order to determine which practices are the most helpful to the students. These data indicated that there are three distinct behavior patterns for these students (Help Seeker, Supplemental Instruction Dependent, and Minimalist), which lead to different levels of conceptual understanding of the material. The effectiveness of the revised course designs and activities were assessed using a mixed method approach. Student performance in these courses and in follow-on courses was used to measure improvements in concept retention. Conceptual tests (Statics and Dynamics Concept Inventories) were administered before and after semesters, and average normalized gains were compared with those for students in traditional learning environments. Open-ended questions on end-of-semester course evaluations assessed student perceptions of the course format. Results indicate increases in conceptual measures in statics with SCALE-UP, significant reductions in failure rates for students in the integrated statics/dynamics course, and reduction in time to completion of statics and dynamics courses. Survey data indicate positive effects on students' use of learning resources, and anecdotal evidence demonstrates that students are continuing the patterns of peer instruction and positive interdependence in follow-on courses. Based on these research findings, faculty development materials were generated that concisely state the pedagogical underpinnings of the method, provide evidence of success in our courses, and identify key aspects of successful implementation of SCALE-UP in engineering courses. These include effective use of learning assistants, well-designed learning activities, and formative assessment questions that emphasize learning objectives and guided inquiry. Course materials have been published, and efforts are under way to promote this as a mainstream teaching resource. Mechanical Engineering students in

both the old and new curricula (n= 316 and 366, respectively) were tracked to glean information about the paths students take as they progress through their degree program and the effects that the new integrated course has had on these paths. For each student, the number of attempts and grades for the courses of interest were recorded. Results indicate nearly the same proportion of students pass the integrated dynamics and statics course on their first attempt as pass both the separate courses on their first attempt at Clemson University. Students in the new curriculum are less likely to quit before completing the course sequence. As expected, it takes students less attempts to pass the new course than to pass both the old courses. Details regarding implementation of this course are discussed. Challenges to achieving success in this new course have been many and demanding. These include (1) development of a dedicated textbook, (2) development of learning exercises to foster student comprehension, (3) reorganization of topical content including topic deletion and added emphasis on certain topics, (4) preparing faculty for change, (5) accommodating limited student maturity, and (6) dealing with widespread misgivings about the project.

Outhred, T., & Chester, A. (2010). The experience of class tutors in a peer tutoring programme: A novel theoretical framework. *Journal of Peer Learning, 3*(1), 12-23. Retrieved from http://ro.uow.edu.au/ajpl/vol3/iss1/3.
This campus program called P2P is based on the PASS model which is based on Supplemental Instruction. Three female first-year class tutors provided insight into how they experienced a novel peer tutoring program embedded in their tutorials. Five themes emerged: role exploration and their professional identity, sharing responsibility, regulation of the peer tutored groups, harnessing the peer tutor role, and community.

Overly, C. (Writer). (1995). Supplemental Instruction overview [Videotape]. In C. Overly (Producer). Kalamazoo, MI: The University of Missouri-Kansas City
This ten minute videotape provides an overview of the Supplemental Instruction (SI) program. It includes brief interviews with SI leaders, SI supervisors and faculty members.

Packham, G., Cramphorn, C., & Miller, C. (2001). Module development through Peer-Assisted Student Support: An initial evaluation. *Mentoring & Tutoring, 9*(2), 113-124.
OPeer-Assisted Study Sessions (PASS), based upon the Supplemental Instruction (SI) model, are used with institutions within the United Kingdom for improvement of the course curriculum. Feedback is provided to the course instructors in such a way that is not easily obtainable through more traditional means. Data is collected through meeting logs, observations, interviews, and questionnaires. This article focused on the use of PASS for this purpose at the University of Glamorgan's Business School.

Packham, G., & Miller, C. (2000). Peer-Assisted Student Support: A new approach to learning. *Journal of Further and Higher Education, 24*(1), 55-65.
Peer-Assisted Student Support (PASS) is based upon Supplemental Instruction (SI) and is the predominate name used in the United Kingdom. This article provides an overview of PASS with specific information about its use at the University of Glamorgan during the 1997-98 academic year in the Business School. PASS is most popular with female

students and those under 21 years of age. Evaluation of the positive impact of PASS participation is limited to the course in which the students attended PASS sessions. Higher rates of PASS attendance was correlated with higher final course grades.

Paideya, V. (2011). Engineering students' experiences of social learning spaces in chemistry Supplemental Instruction sessions. *Alternation, 18*(2), 82-95. Retrieved from http://utlo.ukzn.ac.za/Files/Alternation%2018.2%20%282011%29.pdf.
Students regarded their experiences of the social learning spaces created in the chemistry Supplemental Instruction (SI) sessions as inspiring because of the support they received from SI leaders and peers. SI has been introduced to the first hyear engineering and mainstream chemistry students at the University of KwaZulu-Natal as part of the "Through0ut in Engineering Sciences (TIES) program. SI participants developed a better understanding of concepts through exposure to different points of view and different pedagogical activities offered. The findings reflect that the different pedagogical and learning techniques offered in the SI social learning spaces accommodated for the diversity of students' learning needs, encouraging students to take responsibility for their learning through feedback, motivation and support. Social spaces served for mini revision of concepts, explanations and discussions that improved understanding of concepts and collaboration amongst peers which increased students' confidence in answering questions. The findings from this study show that SI social learning spaces create opportunities for learning engagement that differ from lectures in many ways, particularly as they relate to: (a) offering more opportunities for practice and reflection; (b) access to a variety of questions; (c) access to support and immediate feedback; (d) opportunities for collaboration; (e) students taking responsibility for learning; and (f) motivation to learn. Students commented that student focused learning, which involved peer teaching and learning, encouraged them to: (a) develop thinking, reasoning and social skills which enabled them to engage with the problem solving activities more effectively; (b) develop confidence with respect to making appropriate choices in terms of chemistry concepts; and (c) explore, question and research other alternates as a fundamental component of their learning. It is evident from these responses that students who engaged in these social learning spaces developed a better understanding of concepts through collaboration. It is therefore argued that the social learning spaces created during the SI intervention session have the potential to develop independent lifelong learners in chemistry.

Paideya, V., & Sookrajh, R. (2010). Explroing the use of Supplemental Instruction: Supporting deep understanding and higher-order thinking in chemistry. *South African Jouranl of Higher Education, 24*(5), 758-770.
|Many under-prepared university students do not know how to study (Martin and Arendale 1993) because they have not yet developed the abstract reasoning skills that allow them to learn new ideas simply by reading a text or listening to a lecture. This article draws from selected findings from a PhD study currently being undertaken at a university in KwaZulu-Natal. This article explores the use of Supplemental Instruction (SI) in supporting deep understanding and higher-order thinking skills (HOTS) in stoichiometry in first year chemistry for engineers. The special focus of this article is to investigate whether the quality of teaching and learning in chemistry education is

improved through SI and SI leader intervention. The central question guiding this article is: How does an interactive teaching and learning intervention programme (SI) facilitated by SI leaders potentially engage first year engineering students in deep understanding and HOTS in Chemistry? Since this article focuses on change or growth in natural settings, within stoichiometry in chemistry classrooms, it allowed for video-recordings, observations of SI sessions and focus group interviews which have been used in this study. Data analysis revealed that students preferred the more interactive engagement of SI sessions and discussion around chemistry concepts. Students found that having to explain concepts in their own words and being exposed to other students methods of answering questions greatly improved their understanding of stoichiometry. It was also found that SI leaders encouraged HOTS by asking higher-order questions, engaging in activities that required higher-order thinking as well as encouraged students to reflect on their thinking. It is therefore argued that teaching and learning strategies employed during the SI intervention session have the potential to promote deep understanding and higher-order thinking. (Contains 3 tables and 2 figures.)|

Painter, S. E. (2001). Internet homepage for the National Center for Supplemental Instruction [On-line].Retrieved from http://www.umkc.edu/asm/si/index.shtml
This Internet homepage maintained by the National Center for Supplemental Instruction at the University of Missouri-Kansas City provides a central location for information about SI. Some of the menu items include: overview of SI; links to homepages of SI leaders at UMKC; information about upcoming SI Supervisor training workshops; instructions on how to subscribe to the SI listserv discussion group; SI materials for sale; directory of known SI homepages from other colleges around the world; and a directory of SI-related documents. Currently more than 100 documents are available for viewing at this site about SI by authors at UMKC and elsewhere.

Painter, S. L., Bailey, R., Gilbert, M., & Prior, J. (2006). New directions for Supplemental Instruction. In M. E. Stone & G. Jacobs (Eds.), *Supplemental Instruction: New visions for empowering student learning* (pp. 73-84). New Directions for Teaching and Learning, No. 106. San Francisco: Jossey-Bass
This chapter examines how SI can be implemented in university teaching-learning centers and in thematically based learning communities and with high school students, and with online academic support for distance learning students.

Painter, S. M. (2001). Supplemental Instruction Internet computer discussion listserv [On-line]. Kansas City, MO: The University of Missouri-Kansas, Center for Supplemental Instruction.Retrieved from http://www.umkc.edu/asm/si/sinet.shtml
This moderated computer discussion listserv is provided by the National Center for Supplemental Instruction (SI). Discussion topics include: customizing SI for different content areas; strategies to increase SI attendance; methods to conduct qualitative and quantitative research; and other topics. Subscription to the listserv and is free to anyone, regardless of whether they have an active SI program or not. SI Leaders as well as SI Supervisors are especially invited to join the list. Approximately 350 persons from several countries are members of the listserv. To subscribe to the listserv, send an E-mail message to listserv@listserv.umkc.edu. In body of the message type:

subscribe SInet yourfirstname yourlastname. For more information on SInet, send message to: SInet-Request@listserv.umkc.edu

Pappas, J. G. (1997, 1997, June 5). Pappas praises Supplemental Instruction program, *Central Washington University Observer,* p. 5.
This newspaper article by the Dean of Academic Services at Central Washington University describes the use of Supplemental Instruction (SI) program at the institution. The data from the institution suggest that SI participants earn higher mean final course grades. A higher than estimated number of students (69 percent) participate in the program.

Paramore, T. L. (2007). *Developmental/remedial sciences at community colleges in five states in the central part of the United States.* (Ph.D. dissertation), University of Nebraska-Lincoln, Lincoln, NE. Retrieved from :http://digtalcommons.unl.edu/cehsedaddiss
This dissertation study investigated the use of remedial- and developmental-level academic support services for students enrolled in science courses at the community college level. Among the services noted was Supplemental Instruction (SI) which was offered for some science courses such as in introductory anatomy, chemistry, and physics courses.

Parkinson, N. (2009). The effect of peer assisted learning support (PALS) on performance in mathematics and chemistry. *Innovations in Education & Teaching International, 46*(4), 381-392.
Supplemental Instruction has a long history of effective use in third level education in the United States. However, there are few rigorously controlled studies in which the potentially confounding effects of student aptitude and experience and of ‘volunteer effects’ have been controlled. Analysis of the effects of peer assisted learning in the context of the higher educational system of the UK and Ireland is relatively sparse, with few rigorously controlled studies, and it is therefore difficult to quantify its impact. The researcher carefully conducted a controlled study of the effects of peer assisted learning by second year students with first year students. Prior to tutoring, the tutored and non-tutored groups were very evenly matched. However, after one semester of tutoring there were substantial and significant differences between the tutored and non-tutored students. The tutored students progressively increased their performance at in-house tests in calculus compared to the untutored students, their examination marks in chemistry and calculus substantially improved (>13%) and failure rates were cut dramatically. Student progression was substantially improved.

Parton, S., & Noad, V. (2013). PAL leader training at Bournemouth University: 12 years on and still evolving. *Journal of Pedagogic Development, 3*(2).
Peer Assisted Learning (PAL) at Bournemouth University in the United Kingdom has been operating for more than a decade. This journal article describes the history of the program with the majority of the text dedicated to a detailed overview of the training of the PAL leaders. The article finished with a report of the positive evaluation of the training program by the participants. PAL is a name used in the United Kingdom to

describe similiar programs that were based on the Supplemental Instruction (SI) model from the Univeristy of Missouri-Kansas City.

Pascarella, E. T., & Terenzini, P. T. (Eds.). (2005). *How college affects students: A third decade of research*. San Francisco: Jossey-Bass
On pages 106, 107, 399, and 400 the authors discuss the research studies that have analyzed the effectiveness of Supplemental Instruction (SI). Using published standard deviations from previous research studies, the authors conducted a rough meta analysis of SI. They found that the analysis suggested the effectiveness of SI.

PASS. (n.d.). PASS National Centre Web Site, Retrieved from http://www.pass.manchester.ac.uk/
The National Centre for PASS (Peer Assisted Study Sessions)/SI (Supplemental Instruction) was established in April 2009 to support HEIs to further understand and develop programmes in the United Kingdom. PASS provides a facilitated, group learning opportunity that uses the experiences of higher year students to support the learning of lower year peers. This supplements existing activity (e.g. lectures and tutorials) and enables active learning in an informal, friendly and fun environment. Working with existing and previous PASS Leaders, the National Centre has produced a short clip to explain a bit more about PASS - let us know what you think.

Patt, G. R. (1996). The best way to learn is to teach. *Biosource, 4*(2).
This article describes the use of Supplemental Instruction (SI) as a form of peer-group instruction in biology at Southern Illinois University at Edwardsville. SI leaders report benefits for them since it helps them to prepare for comprehensive examinations such as MCAT or GRE as well as developing teaching skills. Data from Fall 1995 reports that those who attended SI session four or more times earned a mean final course grade of a low B, those who attended one to three times earned a C, and those who did not attend any SI sessions earned a high D grade.

Patterson, L. (2004). Worldwide success. *Perspectives News Magazine of the University of Missouri-Kansas City, 12*(1), 3-7.
This article provides a short overview of the Supplemental Instruction (SI) model and its dissemination to institutions throughout the U.S. and in other countries.

Payton, J., & Overly, C. (1994). Supplemental Instruction and physical geology. *Supplemental Instruction Update*, 1, 3.
This article provides an overview of the use of Supplemental Instruction (SI) in a Physical Geology course at Western Michigan University. This course has served as a "gatekeeper" course for students who are considering geology as a major. Frequently cited SI session activities included: vocabulary development/review; ask group to assist with generating SI session agenda; create a visual matrix to help organize information; frequently use the "informal quiz" to check for comprehension level of SI participants; and create opportunities for students to connect lecture material to SI participants' lives.

Peacock, M. L. (2008). *A program evaluation of Supplemental Instruction for developmental mathematics at a community college in Virginia.* (Ph.D. dissertation), Old Dominion University, Norfolk, VA.
With the current emphasis on accountability and the importance of math skills in our present economy, the success of developmental mathematics students at community colleges is critical. How to improve the success of these developmental students has become the impetus for many educational initiatives. One educational innovation in tutoring, called Supplemental Instruction (SI), has been successfully applied to high-risk courses which are defined to have a failure rate in excess of 30%. Mid-Atlantic Community College, in its Title III grant which seeks to improve the success of developmental students, selected Supplemental Instruction (SI) as its initiative. This program evaluation investigated the effects of SI on the learning gains, persistence, course completion, metacognitive and study skills of the developmental math students at Mid-Atlantic Community College. Qualitative and quantitative methods were used in this research study. The researcher confirmed that the application of SI to developmental math at the community college did positively impact students' learning gains, persistence, and course completion when comparing SI classes to non-SI classes. The MSLQ revealed a positive impact in the areas of help-seeking and organization for SI students. The researcher also found a much larger withdrawal rate during the semester among non-SI students. The program evaluation revealed some aspects of the SI program that were not fully implemented. Near significance suggests that further investigations would be indicated in course completion rates and college persistence in a study with a larger sample size. Also, the MSLQ should be given as a pre-test with the students given feedback on how to improve their metacognitive and study strategies. Additionally, the effect on student performance of scheduling of a mandatory SI session each week should be investigated. While much of the research on SI has been performed at four year colleges and in non-developmental courses, this study confirmed that SI can make a difference in the lives of developmental students at the community college level. The leadership of the community college is interested in the success of their developmental students and their retention, as well as the impact that SI could have on many other high risk courses.

Peled, O. N., & Kim, A. C. (1995). *Supplemental Instruction in Biology at the college level.* Conference Proceedings of the 19th Annual Conference of the National Association for Developmental Education, Chicago, IL. (ERIC Document Reproduction Service No. ED394414).
Supplemental Instruction (SI) in 14 biology classes at National Louis University (Chicago, IL) was found to significantly increase student achievement (74.1 percentile vs. 67.6 percentile for non-SI participants). An additional analysis studied students with low grades (below the 60th percentile) and high grades (above the 80th percentile). SI attendance was positively correlated with higher grades. Many of the SI leaders in biology have been students intending to major in elementary education.

Peled, O. N., & Kim, A. C. (1996). Evaluation of Supplemental Instruction at the college level. *The Learning Assistance Review, 1*(2), 23-31. Retrieved from ERIC database. (ED410777).

This article analyzed the Supplemental Instruction (SI) model as it was used in 14 sections of the same high-risk biology course between Winter 1990 through Winter 1993 at National-Louis University (Chicago, IL) which is a multicultural, multiethnic university campus. Rather than reviewing a comparison of SI and non-SI attendees within the same class, the comparison was the academic performance of students in classes that had SI available and classes that did not. The researchers believed that this was another way to help control for the possible effects of student motivation. Examination grades indicated that the average grade of students in classes that had SI sessions was significantly higher than that of students in classes where SI sessions were not offered (scale 0 to 100: SI classes, 74.1 percentile vs. 67.6 non-SI classes, $p < .05$). Within classes that had SI sessions offered for students, SI participants earned a final course grade 12 percent higher than non-SI participants. In classes in which an SI leader was available, the number of students receiving grades below 60 percent decreased; whereas, the number of students receiving grades above 80 percent increased.

Peoples, D. M. (1993). *Supplemental Instruction: Is it effective?* (Master of Arts thesis), Rowan College of New Jersey, Rowan, NJ.
This Master of Arts Thesis studied the impact of Supplemental Instruction (SI) in 1991-1992 with fifteen 7th and 8th grade junior high school students with a disability enrolled in Overbrook Junior High School of the Lower Camden County Regional High School District Number 1 (NJ). The students were classified either Emotionally Disturbed, Perceptually Impaired or Neurologically Impaired. The students in the study were divided into three groups: those currently receiving SI (CSI) and are mainstreamed in all four of the core academic subject areas; those who previously received SI (PSI) and are mainstreamed in three of the subject areas and only receive resource room instruction; and those who never received SI (NSI) and are mainstreamed in two of the subject areas and only receive resource room instruction. The significance of this study is that SI provides another venue for students with a disability to be educated in the least restrictive environment and be mainstreamed with other students. Departing from the traditional SI model, the following modifications were made to the delivery of the SI program: (1) due to state regulations the SI leader in this study was a certified teacher of disabilities for grades N-12; (2) SI participants were limited to the "at-risk" students with a disability; and (3) due to state regulations the SI groups were limited to no larger than five students. The researcher noted that a common characteristic of SI for traditional college students and the high school students with a disability is that both populations had varying academic ability levels. The CSI students most of the time received higher final course grades than the PSI group, which in turn generally received higher grades than the NSI group. Interviews with parents suggested high satisfaction with the SI program and favored it over the resource room instruction. Students also requested assistance more during the SI sessions than during the resource room instruction. The researcher suggested that the smaller size of the SI sessions in comparison with the resource room instruction was less threatening for students to reveal their needs.

Perrone-Saneski, C. (1984, 1984, May 13). Course sharpens freshmen's reasoning skills, *Troy Times Newspaper,* p. 1.
This newspaper article provides an overview of the Supplemental Instruction (SI) program. The article contains an interview with Deanna Martin, SI's creator. According to Martin, as many as 50 percent of college freshmen do not have the learning skills necessary to understand their coursework since they lack advanced reasoning skills. Martin was in Albany, NY presenting a seminar sponsored by the ACT National Center for the Advancement of Educational Practices concerning the use of SI in improving academic performance of students.

Peterfreund, A. R., Rath, K. A., Xenos, S. P., & Bayliss, F. (2008). The impact of Supplemental Instruction on students in STEM courses: Results from San Francisco State University. *Journal of College Student Retention, 9*(4), 487-503.
This article reports a research study concerning Supplemental Instruction (SI) at San Francisco State University. The focus was on students enrolled in science, technology, engineering, and mathematics (STEM) academic degree programs. Data was collected for these students who enrolled in General Chemistry 1, Introduction to Biology 1, introductory statistics, Calculus 1, and/or Calculus II.The study examined students over a six-year time period and found that SI participants earned higher grades and progressed through subsequent courses in an academic sequence more efficiently. High grades for STEM students is especially important since passing grades are insufficient to maintain standards for academic progress. These positive findings occurred despite the SI participants having an average lower academic profile than the nonparticipants. More females participated in SI than their proportion in the class. Male students and students from historically-underrepresented groups in college benefited the most, especially in introductory courses.

Peters, C. B. (1990). Rescue the perishing: A new approach to Supplemental Instruction *The Changing Face of College Teaching* (pp. 59-68). San Francisco, CA: Jossey-Bass, Inc.(ERIC Document Reproduction Service No. ED344539).
This chapter describes an experiment of providing an a modified version of the Supplemental Instruction program at the University of Rhode Island (Kingston, RI). The author is an associate professor of sociology and anthropology. Rather than hiring student SI leaders to facilitate the SI sessions, the course professor performs the task. According to the author, these out-of-class sessions appear similar to ones facilitated by student leaders. Participating students report satisfaction with the sessions.

Phelps, J. M. (2005). *Supplemental Instruction in a community college developmental mathematics curriculum: A phenomenological study of learning experiences.* (Ph.D. dissertation), University of Central Florida, Orlando, FL.
This research study used a phenomenological approach at a community college to identify factors that motivated students' attendance and subsequent learning experiences in Supplemental Instruction (SI) sessions that supported developmental mathematics courses. Interviews were held with both SI participants and the SI leaders. Additional data was gathered through a Multiple Intelligence Inventory. The data suggested eight themes of motivation for students participating in the voluntary SI

sessions and nine themes characterized the types of learning experiences that occurred in the SI session. SI was found to be a significant factor in academic achievement in the developmental mathematics courses. Findings suggest that SI helps create a climate of achievement for learners taking developmental mathematics in a community college setting.

Phelps, J. M. (2007). *A key strategy for Achieving the Dream (AtD): Adapting Supplemental Instruction (SI) to the developmental mathematics setting*. Unpublished manuscript. Valencia Community College. Florida.
This PowerPoint presentation describes how the Supplemental Instruction (SI) model has been incorporated with the Achieving the Dream program at Valencia Community College (FL) to increase success of students in developmental mathematics.

Phelps, J. M., & Evans, R. (2006). Supplemental Instruction in developmental mathematics. *The Community College Enterprise (formerly Michigan Community College Journal), 4*(6).
After an extensive review of the professional literature concerning Supplemental Instruction (SI), especially among community colleges, the articles focuses on its use at Valencia Community College in Orlando, FL during 2003 and 2004. Results included: increase in completion rate of the course (52% vs. 35%); higher final course grade (2.57 vs. 2.22; SI participants reported a lower level of test anxiety; and SI participants reported a higher level of confidence in their abilities. The article concludes with identifying new avenues for investigation of the SI model, especially with a deeper understanding of student motivation.

Phillips, K. (1995). *Supplemental Instruction in Australia*. Unpublished manuscript. The University of Missouri-Kansas City. Kansas City, MO.
This report records the observations by a staff member from the National Center for Supplemental Instruction (SI) located in Kansas City, MO during her professional development leave in Australia in the first half of 1997. The author records her observations concerning the SI programs operating at Queensland University of Technology, University of Southern Queensland, and the University of Western Sydney-Nepean. Some of the adaptations of the SI model frequently used with Australian higher education include: use of multiple SI leaders in a single class, SI leaders work in pairs during SI sessions, and the SI program is usually decentralized on campus. Often the course lecturer selects, hires, trains, evaluates, and supervises the SI leader. This administrative procedure encourages higher involvement of the lecturer in the SI program. A drawback mentioned by the author is that this responsibility is added due to heavy work demands placed upon the lecturer for other responsibilities. There is continuing discussion with Australian educators regarding the strengths and challenges with a decentralized SI administrative structure.

Phillips, K. (1999). *Proceedings of the First National Conference on Supplemental Instruction/VSI*. Kansas City, MO: Center for Academic Development, University of Missouri-Kansas City.

This set of conference proceedings provides an overview to the First National Conference on Supplemental Instruction/VSI here in Kansas City, MO in May 1999. Articles include: SI, an effective program within student affairs, Edit Kochenour and Kenneth Roach; Get creative, working with SI data, Jeanne Wiatr and Barbara Stout; SI supporting quality in higher education in the United Kingdom, Jenni Wallace; Managing an expanding program or SI empire, Valeric Merriwether; Supplemental Instruction with math study skills templates, Paul Nolting and Kimberly Ruble; SI down under, Australian innovations, Martin Murray; Distance PALS in real and virtual classes, Judith Couchman; SI leadership and personal grown, a South African perspective, Linda Smith; Discipline-specific SI strategies for writing, Sandra Zerger; VSI, partnerships, and the transformation of education in South Africa, Paul Du Plooy and Cathy Clark; and SI leaders, the real winners, Maureen Donelan.

Po, Y. K. (2004). *An evaluation of a Supplemental Instruction program.* (Master's of Arts thesis), University of Hong Kong, Hong Kong. Retrieved from http://hub.hku.hk/handle/10722/31605
Supplemental Instruction (SI) has been introduced at the University of Hong Kong. The focus for this masters' thesis was on the usefulness of SI with a business statistics course during 2004 and 2004. the study involved both a comparison of SI and non-SI participant grades as well as semi-structured interviews and observations to further evaluate the utility of SI. While there was no improvement in final course grades, interviews with the SI participants revealed the following themes: more opportunities to discuss the course, increased confidence in the subject matter, and reduced test anxiety.

Pollock, K. (2005). Tracking D, F, and W students could bring at-risk students, classes to light. *Enrollment Management Report*.
Supplemental Instruction (SI) is identified as an effective program for increasing academic success of at-risk students.

Porter, R. C. (2010). The effects of supplemental instruction on student achievement in College Algebra. *Georgia Journal of Science, 68*(3), 124-131. Retrieved from http://www.freepatentsonline.com/article/Georgia-Journal-Science/236983055.html.
College Algebra consistently has a very high number of students performing poorly. An experimental study addressing student performance was conducted. Two College Algebra classes each with 25 students and with the same teacher were used, one as the control group and the other as the experimental group. The experimental class included mandatory Supplemental instruction (SI) for an extra class period per week. T-tests were used to compare performances on each test and homework. A Repeated Measures 2x2 ANOVA was used to compare the students' performance on a pre-test and a post-test between each class. The Mann-Whitney U-test was used to compare final grade distributions. The results of the T-tests were not significantly different. The results of Repeated Measures 2x2 ANOVA indicate that here was not a significant difference between the two classes' performance. Finally, the Mann-Whitney U-test showed that there was not a significant difference between the final grade distributions.

Potts, S. A. K. (1998). Impact of mixed method designs on knowledge gain, credibility, and utility of program evaluation findings [Dissertation, Arizona State University, 1998]. *Dissertation Abstracts International, 59*(06), 1942A.
This dissertation study attempted to understand the relationship between evaluation approach and the perceived knowledge gain, credibility, and utility of findings. Specifically, the researcher investigated whether or not quantitative, qualitative, and mixed-method evaluations produced different kinds and amounts of knowledge gain, different levels of credibility, or suggested different types of use. To investigate this question, the researcher selected a group of consumers of evaluations, presented them with three simulated evaluation case summaries, and interviewed them for their reactions. Participants included ten administrators from academic success and student service programs at Arizona State University. The evaluation case summaries were of a study counseling center, a summer transition program, and a Supplemental Instruction (SI) program. Each summary highlighted the evaluation's purposes, research questions, data collection methods, findings, conclusions, and recommendations. Participants ranked the mixed-method summary the highest in knowledge gain because it portrayed the most comprehensive picture of program participants, processes, and outcomes. The mixed-method summary was ranked the highest in credibility because it allowed participants to experience the program through the eyes and voices of the students. Participants also ranked the mixed-method summary the highest in utility since it prepared them for such internal administrative responsibilities such as strategic planning, high stakes decision-making, and programmatic improvement. Even though SI was not the primary focus of this study, the findings illustrate the need for careful evaluation of SI programs. The research suggests that SI program administrators should use the mixed-method evaluation system to provide the most helpful and convincing data for policy makers.

Power, C. (2010). Peer Assisted Study Sessions (PASS) through a complexity lens. *Australasian Journal of Peer Learning, 3*(1), 1-11. Retrieved from http://ro.uow.edu.au/ajpl/vol3/iss1/2.
This study investigates Peer Assisted Study Sessions (PASS), a commonly used term when describing implementation of Supplemental Instruction (SI) in Australia. This paper suggests complexity theory provides a useful conceptual lens for analyzing this multifaceted peer learning program. Dimensions of complexity such as self-organization, fractality, dynamism and emergence offer ways of deeper understanding of the SI/PASS model. The author argues that deeper understanding of the underlying theory and essential components of SI/PASS help when making adaptations of the model to meet needs.

Prendi, L. (2011). Strategic priority funding: Foundational Mathematics Instruction (62-140), Retrieved from http://web4.uwindsor.ca/units/researchEthicsBoard/studyresultforms.nsf/b16c81cd4c873b9085256f31005fff04/e3ea0dc1d204123785257965007f6f8a2/$FILE/Report_23Sept2011.pdf
The paper describes the use of Supplemental Instruction at the University of Windsor in Canada in a math course. It can be concluded that the historical trends indicate an

increase in student performance and drop in failure rates on the first semester of SPF implementation. However, the results were not maintained in the second semester. It is not clear at this point which factors affected the trend of the results in the second semester. Pre and post-survey results indicate an increase in computational and calculus skills. The increase was statistically significant overall and specifically for the group of students that participated in both pre and post-surveys. However, the majority of those students got A's and B's and this fact should be considered in the analysis and when planning future surveys. If only good students participate in the survey than the data are not representative of the whole group. In general the results are very promising and indicate the potential that this project has in improving the students' success in foundational mathematics course.

Preszler, R. W. (2005). *Improving student's performance in a challenging biology course: Assessing specific components of Supplemental Instruction*. Unpublished manuscript. New Mexico State University. Las Cruces, NM. Retrieved from http://spacegrant.nmsu.edu/NMSU/2005/Preszler.pdf
This report describes the use of Supplemental Instruction (SI) in a biology course at New Mexico State University (Las Cruces, NM). The students enrolled in the course were provided SI sessions outside of class. In some of these sessions, a traditional SI model was used with the it being a student-directed session. Another session was more teacher-driven. Another session used a combination of both student- and faculty-driven sessions. The results for the students depended upon their academic preparation level. Students who were most underprepared did not benefit much from the SI experience, regardless of the orientation of the session. Students who had modert preparation benefited the most from the student-centered sessions. The sessions with students who had the most preparation benefited regardless of whether it was student- or teacher-centered.

Preszler, R. W. (2006). Student- and teacher-centered learning in a supplemental learning biology course. *Bioscene: Journal of College Biology Teaching, 32*(2), 21-25.
This article describes the use of an adapted version of Supplemental Instruction (SI) in a large biology lecture. With this experiment, students in the large biology course participated in one of several supplemental learning groups outside of the lecture sessions: (a) teacher driven sessions; (2) student driven sessions similar to SI; and (c) sessions that alternated the learning environment between teacher and student driven discussions. Students could voluntarily choose to enroll in a "Learning Biology" course that used one of the three previously described learning environments. The results were mixed for which of the three was best, however, it appears that this model with an optional course enrollment for the Learning Biology course yielded higher academic achievement for the participating students than a purely voluntary model which generally yields lower outcomes for the students. The researcher recommends further investigations with these models.

Price, J., Lumpkin, A. G., Seemann, E. A., & Bell, D. C. (2012). Evaluating the impact of Supplemental Instruction on short- and long-term retention of course content. *College Reading and Learning, 42*(2), 8-26.

At the University of Alabama at Huntsville a team evaluated the effectiveness of Supplemental Instruction with short- and long-term retention of course content. The researches tracked 75 students enrolled in an introductory psychology course. Results indicated the SI participants improved both types of retention of course content measured through course quizes and major exams..

Price, M., & Rust, C. (1994). Introducing Supplemental Instruction in business courses in a modular programme. In C. Rust & J. Wallace (Eds.), *Helping students to learn from each other: Supplemental Instruction, SEDA Paper 86* (pp. 31-36). Birmingham, England: Staff and Educational Development Association
Oxford Brookes University in the United Kingdom is using the Supplemental Instruction program in the School of Business. SI was implemented with larger business courses (400 to 500 students) to enhance the learning environment for the students enrolled in these elective courses that are outside their field of study. Rather than paying the SI leaders, they were given academic credit for the experience. The research studies of students enrolled in the targeted courses suggested a positive correlation ($p < .05$) between SI participation (two or more times) and higher final course grades (Introduction to Business, 61.4 percentile vs. 56.2 percentile for non-SI participants; Managing Concepts, 60.7 vs. 54.6; and Changing Environment of Business, 56.6 vs. 46.2) . The SI participants attracted a higher percentage of female and older students than represented in the total class.

Price, M., & Rust, C. (1995). Laying firm foundations: The long-term benefits of Supplemental Instruction for students in large introductory courses. *Innovations in Education and Training International, 32*(2), 123-130.
This article contains the results of the use of Supplemental Instruction (SI) to support student learning in business modules at Oxford Brookes University in the United Kingdom. The courses were selected due to their large size and the need to ensure mastery of course material that was prerequisite for the next course in the sequence. Quantitative and qualitative studies in 1993-94 suggest that SI was beneficial in increasing mean final course grades in the courses supported by SI (Introduction to Business: 61.4 percentile for SI participants vs. 56.2 percentile for non-SI; Managing Concepts: 60.7 vs. 54.6; Changing Environment of Business: 59.6 vs. 46.4). Further analysis showed that there was no correlation between entry qualifications and performance in the classes. In comparison with non-SI participants, former SI participants earned mean final course grades that were higher in subsequent courses in the business sequence that did not have SI support provided (54.9 percentile for former SI participants vs. 48.8 percentile for former non-SI). This finding was confirmed through interviews with students who reported using learning strategies from SI sessions in other classes. This suggests that SI provided transferable benefits for additional courses in the sequence.

Prior, J. (2004). *Development of PAL Online: An analysis of the first part of a two-stage trial*. Unpublished manuscript. Oxford Brookes University.
This report abstract describes the use of Peer Assisted Learning (PAL) at Oxford Brookes University (England) in the Business School . PAL is an adaption of the

Supplemental Instruction (SI) program. The researcher are studying the impact with online academic support though the use of PAL leaders. Their role would be slightly different with a shift towards being more interventionist and less of a facilitator. This trial will form the first stage of a two stage trial. Stage two will be the implementation of online discussion on a large core module next term. The ultimate aim of the research is to develop a model for PAL online that covers areas such as site design, PAL leader training and support, the needs of both participant and leaders and the potential benefits for both groups.

Pryor, S. A. (1990). The relationship of Supplemental Instruction and final grades of students enrolled in high-risk courses [Dissertation, Western Michigan University, 1989]. *Dissertation Abstracts International, 50*(07), 1963A. (University Microfilms, No. 8923554).
The purpose of this doctoral dissertation research study was to determine if there was a significant relationship between attendance at Supplemental Instruction (SI) and final course grades. Unlike some other studies that included SI leaders who were graduate students, community persons, or faculty members, this study only examined SI sessions that were facilitated by undergraduate students. The three science courses at Western Michigan University studied were Animal Biology, Plant Biology, and Introduction to Physics. Attendance at SI was significantly related to final course grades (4.0 grade point scale: 2.64 for SI participants vs. 2.27 for non-SI participants, $p< .002$), and students who attended SI earned significantly higher final course grades than students who did not attend SI. Even when final course grades were adjusted for composite ACT score, the SI group maintained the half letter grade positive difference. There was also a significant difference in the grade distribution of students who attended SI and students who did not attend SI. The rate of D, F and course withdrawals much significantly lower for the SI group (25% vs. 39%, $p< .05$). There was a positive correlation between higher levels of SI attendance and higher mean final course grades. Students who attended three or more SI sessions earned a full letter grade higher than the non-SI group (adjusted mean final course grades: zero SI attendance, 2.27; attended SI once or twice, 2.45; attended three to six SI sessions, 3.07; and attended SI sessions seven or more times, 3.10)

Quinn, K. B. (1990). *Retaining undergraduates and training graduates: A variation on Supplemental Instruction in a College Biology class.* Conference Proceedings of the 14th Annual Conference of the National Association for Developmental Education, Boston, MA.
This article described a retention program based on a variation of the Supplemental Instruction (SI) model piloted in the Academic Skills Program at the University of Illinois at Chicago. SI leaders were graduate students enrolled in the Masters of Teaching Science program at the university. The intent of the pilot program was not only to increase the academic performance of students and the number of students who completed Biology 102 -- one of the most difficult courses for non-majors at the university -- but also to provide a training experience for graduate students who were going into teaching science in the public schools and the community colleges. Research suggests that freshmen SI participants earned higher mean final course

grades (3.23 vs. 2.90). Students who attended SI six or more times during the academic term received no lower than a final course grade of B. There was a positive correlation between SI attendance and higher grades (zero to five point scale): attended one SI session, mean final course grade of 3.16; attended two to five, 3.56; attended six to ten, 4.50; attended eleven to twenty-seven, 4.00.

Rabitoy, E. (2011). *Supplemental Instruction in STEM-related disciplines on a community college campus: A multivariate path-analytic approach.* (Ed.D dissertation), California State University, Fullerton.
This study evaluated the impact of a community college Supplemental Instruction (SI) program on academic achievement. The research assessed the relationship between student demographics and academic preparation to factors related to student participation in SI and academic achievement in Science, Technology, Engineering, and Mathematics (STEM)-related curriculum. The study evaluated an a priori model based on Astin's input, environment, outcome college impact model, utilizing a multivariate path analytic approach. Several input variables directly predicted academic success. Female students of color earned significantly lower final course grades and cumulative GPAs than did students not classified within this demographic. Both prior GPA and Math placement score predicted final course grade and final cumulative GPA for all students. Female students attended more SI sessions than did male students, and high GPA predicted increased SI attendance for all participants. Higher scores on the Math placement exam predicted decreased SI attendance. Several statistically significant relationships existed between environment variables and academic achievement. For students of color, enrollment in a class section with an SI leader of color and or a faculty member of color predicted increased academic achievement. White students enrolled in a course section with a faculty member of color experienced increased SI attendance and a small increase in academic achievement. With the exception of White students, enrollment in a class section with a female SI leader predicted increased SI attendance. With the exception of male students, students enrolled in a course section with a White SI leader experienced increased SI attendance. Increased SI attendance positively predicted academic achievement for all participant groups but particularly so for students of color. The results of the study provide researchers and practitioners with insight into the effective design, implementation, and evaluation of SI programs on community college campuses. These findings suggest that the gender and ethnicity of the student, faculty member, and SI leader have an impact on the SI environment for community college students enrolled in STEM curriculum. More importantly, the findings imply that the establishment of a diverse SI environment is critical to the success of the diversified student body that characterizes the community college system of today.

Rachal, K. (2006). *The past, present, and future of Supplemental Instruction at Southeastern Louisiana University.* (Ph.D. dissertation), Southeastern Louisiana University, Hammond, LA.
This thesis provides an in--depth look into the development and structure of the Supplemental Instruction (SI) program at Southeastern Louisiana University. The author had four years of experience as an SI leader, SI graduate assistant, and the current campus SI Coordinator.

Rafi, F., & Karagiannis, N. (2014). A comparative study of African-American males vs females at a minority institute of higher learning and the role of Supplemental Instruction. *Journal of Peer Learning, 6*(1), 76-85. Retrieved from http://ro.uow.edu.au/ajpl/vol6/iss1/7.
The purpose of this paper is to draw a comparison of high attrition rates among African-American males versus African-American females in higher education and examine the role of Supplemental Instruction (SI). The study was conducted at a minority institution (Winston-Salem State University) where African-American students are in the majority. For this study, data was utilised from Cooperative Institutional Research Program (CIRP) surveys, Accuplacer placement test scores of incoming freshmen populations, and academic assistance pursued through the SI Program by African-American male and African-American female students. Primary sources and available statistical information were also used. Comparisons were made between the study habits of African-American male and African-American female students and their implications for the retention rates of these students. These comparisons are presented in the findings section of the paper. Brief conclusions end the paper.

Ramirez, G. M. (1997). *Supplemental Instruction.* Conference Proceedings of the Proceedings of the 13th and 14th Annual Institutes for Learning Assistance Professionals: 1992 and 1993. Retrieved from http://www.lsche.net/?page_id=1201
This article provides a basic overview of Supplemental Instruction (SI). Data is reprinted from a 1983 research study by Drs. Martin and Blanc on the effectiveness of SI. The SI program was customized at California State University, Long Beach to more effectively target first-generation and economically-disadvantaged students for service. Participating students attended SI sessions on a weekly basis and received academic credit. Research studies from 1990 suggest that students from less academically-prepared backgrounds benefitted twice as much as traditional students who attended SI. Results were highest in SI sessions where the SI leader emphasizes both content mastery and development of critical thinking/study skills in comparison with SI leaders who focused primarily on mastery of the academic course material.

Ramirez, G. M. (1997). Supplemental Instruction: The long-term impact. *Journal of Developmental Education, 21*(1), 2-4, 6, 8, 10, 28.
This study addresses two questions about the impact of Supplemental Instruction (SI) on students in a large urban university (California State University, Long Beach): what academic performance benefit is realized beyond the target course supported by SI, and whether SI participation strengthens the persistence patterns of particular student populations. A unique feature of the SI program at Long Beach is that students enroll for a one-unit prebaccalureate class to gain admission to SI sessions. In this way SI becomes a part of the student's weekly schedule and student participation is higher than programs where SI attendance is voluntary. Participants from various student groups were tracked for a period of 8 semesters beginning in Fall 91, and their performance and retention patterns were compared with those of control peer groups of nonparticipants. SI was found to have essentially an immediate impact (grade range: 4.0 to 0.0; target course: 2.86 vs. 2.27 and semester GPA: 2.77 vs. 2.49) on traditional

students; however, it has a substantial impact on performance [2.52 vs. 1.82] and retention [70% vs. 51%] for special-admit students and a definite benefit for underrepresented or underprepared students. Low motivated students, as evidenced by their prior college performance, maintained consistent improvement after SI participation.

Ramming, V. (1989). Supplemental Instruction: A proactive front loading model. *New Jersey Association of Developmental Educators Newsletter*, 1.
This newsletter article provides an overview of the Supplemental Instruction (SI) program.

Rath, K. A., Peterfreund, A. R., Xenos, S. P., Bayliss, F., & Carnal, N. (2007). Supplemental Instruction in Introductory Biology I: Enhancing the performance and retention of underrepresented minority students. *CBE-Life Sciences Education, 6*, 203-216.
Supplemental Instruction (SI) was used at San Francisco State University in an Introductory Biology I class. Participation in the voluntary SI program was beneficial and especially so for students who are underrepresented minority students in the sciences. Data was analyzed between 1999 and 2005 consisting of a pool of approximately 1,500 students in the classes where SI was offered. Following national averages, about one-third of the students participated in SI. The SI participants had higher outcomes in comparison with the non-SI participants: (a) proportion receiving a "C-" final courses or higher, 82% vs. 72%; (b) average final course grade, 2.29 vs. 1.99; (c) proportion ultimately graduating from SFSU, 67% vs. 59%. The SI participants reenrolled in the class multiple times by a slightly higher rate, 19% vs. 16%. In comparing the SI and non-SI participants, the SI participants had lower college entrance scores, lower high school graduation rank percentile, and higher rate of underrepresented student population in science majors. When comparing only the underrepresented students in the class, the results favored even more dramatically the SI participants: (a) earned final course grade of C- or higher, 80% vs. 55%; (b) average final course grade, 2.22 vs. 1.49; (c) proportion ultimately graduating from SFSU, 73% vs. 50%. The authors share several theories as to why SI was more beneficial to the underrepresented minority students including that they benefited the most since they had the most disadvantages to overcome in college due to their academic preparation in high school.

Rath, K. A., Peterfreundt, A., Baylisst, F., Runquist, E., & Simmonis, U. (2012). Impact of Supplemental Instruction in entry-level chemistry courses at a mid-sized public university. *Chemistry Education, 89*(4), 449-455.
This paper examines the impact of supplemental instruction (SI)—nonremedial workshops that support regularly scheduled courses—on four different chemistry courses: General Chemistry I and II, and Organic Chemistry I and II. Differences in how SI impacts student performance in these courses are discussed, particularly in terms of whether students from underrepresented minority groups are affected differently from their peers. We found that SI appears to be most effective in courses at the beginning of the chemistry sequence and least effective in those in which students have already had to demonstrate effectiveness with the material in order to succeed in the course; its

impact on performance in General Chemistry I appears to be quite high compared to a negligible impact in Organic Chemistry II. Impacts appear to be due to SI itself rather than the academic fitness of the students who opt to enroll in it. In the four courses examined, SI did not appear to have a different impact on students from underrepresented minority groups than it did on their peers.

Reeve, A. (1989). Different approach to tutoring: Supplemental Instruction. *Aspirations: Association of Special Programs in Region Eight Newsletter, 2*, 1.
This newsletter article provides an overview of the Supplemental Instruction (SI) program with advantages of the SI model in comparison with traditional tutoring.

Reittinger, D. L., & Palmer, T. M. (1996). Lessons learned from using Supplemental Instruction: Adapting instructional models for practical application. *Research and Teaching in Developmental Education, 13*(1), 57-68.
This article describes the use of Supplemental Instruction to increase student academic achievement. A research study suggests that SI contributed to higher mean final course grades in an introductory psychology course (Psychology 110) over five semesters in seven sections. Several lessons learned included: SI provides professional development opportunities for the SI leader; SI attend may be negatively affected if the SI leader quits attending the class lecture sessions; students will not attend SI if the scheduled times are inconvenient; and requiring students to attend 90 percent of the SI sessions to receive extra academic credit from the course instructor results in less than ten percent of the students choosing to attend at that level.

Ribera, A. K., BrckaLorenz, A., & Ribera, T. (2012). *Exploring the fringe benefits of Supplemental Instruction*. Paper presented at the Association for Institutional Research Annual Forum, New Orleans, LA. Retrieved from http://cpr.iub.edu/uploads/AIR%202012%20%28SI%20Final%29.pdf.
Supplemental Instruction (SI) is an academic support program geared toward promoting engagement and effective study skills among students in “high-risk” courses. Despite knowledge of the positive relationship between SI and student achievement and retention, little is known about how SI relates to other forms of effective educational practices and what type of student populations are more or less likely to engage in SI. Using data from the 2011 NSSE, students that participated in SI experiences had significantly ($p < .001$) higher engagement, deep approaches to learning, and self-reported gains scores than students that had not participated in SI experiences. Effect sizes for these differences were noticeable, particularly for senior students. These findings suggest that SI experiences may contribute to important outcomes such as other forms of engagement and students’ perceptions of gains while in college.

Ricardo, J., Guide, V. G., Hanson, A., Auzenne, M., & Williamson, S. (2007). *Enhancing critical thinking skills of civil engineering students through Supplemental Instruction*. Paper presented at the American Society for Engineering Education Annual Conference, Honolulu, Hawaii. Retrieved from http://icee.usm.edu/icee/conferences/asee2007/papers/907_ENHANCING_CRITICAL_THINKING_SKILLS_OF_CI.pdf.

Supplemental instruction in civil engineering curriculum has been conducted at New Mexico State University since spring 2003. The SI session is designed to develop critical thinking skills of the students by applying collaborative learning methods. The SI session meets once per week to resolve student's questions in the topics of domestic water and wastewater treatment. Prior to meeting in the SI session, students submit questions on the engineering and design concepts discussed within the previous week of class. Active learning in the classroom and self-directed learning outside of class create opportunities for the students to identify questions which can be resolved in the SI session. Students follow a set of steps to develop proper questions and find solutions to their own questions by applying critical thinking skills. The course also requires the students to exercise critical thinking skills as it involves design oriented open-ended problem solving. The student improvement through the SI sessions has been monitored for three consecutive semesters. Comparisons have been made between the SI group and non-SI group students in terms of academic performance throughout the semester. Bloom's levels of learning have been considered to measure the student learning through critical thinking exercises. It has been observed that SI participants have performed better than others in monitoring work examples. Also the SI group earned better grades than the non-SI group in the class.

Rich, C. E., Williford, A. M., & Kousaleous, S. L. (1997). Supplemental Instruction at Ohio University: Improving student performance. In P. L. Dwinell & J. L. Higbee (Eds.), *Developmental Education: Enhancing student retention* (pp. 37-44). Carol Stream, IL: National Association for Developmental Education
This study of student performance compared final course grades of students who attended Supplemental Instruction (SI) study sessions with grades of those who did not attend SI study sessions during the period of Fall 1993 through Spring 1995. Results indicated that, with gender and aptitude controlled, students who attended SI study sessions generally finished the targeted course with higher grades than students who did not attend, and that frequent attendees completed courses with final course grades that were generally higher than infrequent or non-attenders. Students who most need academic support, as identified by lower aptitude scores, comprised a majority of attenders. Poor performance, early withdrawal, and failure rates were lower among SI attenders than among non-attenders for most courses in which SI was offered.

Richardson, S. (1994). How Supplemental Instruction came to Britain. In C. Rust & J. Wallace (Eds.), *Helping students to learn from each other: Supplemental Instruction, SEDA Paper 86* (pp. 15-16). Birmingham, England: Staff and Educational Development Association
The author describes the role of Dennis Congos -- a Certified SI Trainer -- in introducing the Supplemental Instruction model at Kingston University in the United Kingdom.

Richter, A. M., & Augdahl, J. (2003). *Supplemental Instruction for introductory chemistry courses at North Dakota State University.* Conference Proceedings of the 225th American Chemical Society National Meeting, New Orleans, LA. For more information, contact the authors at the Department of Chemistry, North Dakota State University, Fargo, ND 58105, amy.richter@nodak.edu

Supplemental Instruction (SI) is used at North Dakota State University to support students enrolled in challenging introductory chemistry courses.

Rizvi, T. (1988, 1988, September 23). Study with a buddy: Supplemental Instruction fills the learning gap, *Campus Report: The University of Dayton Newspaper,* p. 1.
This newspaper article describes the use of Supplemental Instruction (SI) in ECO 203 Microeconomics and ECO 204 Macroeconomics at the University of Dayton (OH).

Rizvi, T. (1997, 1997, June 16). Law students give each other help, reduce failure rate, *Campus Report: The University of Dayton Newspaper,* p. 1.
This newspaper article describes the use of an academic support program modeled after Supplemental Instruction (SI) with first-year law students at the University of Dayton (OH). Interviews with faculty members and students emphasized that the program was not about students being underprepared, rather it was to help students bridge into a different learning style. The failure rate for students of color involved in the program have dropped from 30 percent three years ago to 6.5 percent last year. The article also contains an interview with David Arendale from the University of Missouri-Kansas City where the SI program has been used for five years in the UMKC School of Law with similar positive results.

Rockefeller, D. J. (2003). An online academic support model for students enrolled in Internet-based classes [Dissertation, University of North Texas, 2000]. *Dissertation Abstracts International, 63*(09), 3095.
This doctoral dissertation from the University of North Texas describes a research study that examined the effectiveness of an experimental Supplemental Instruction (SI) program that utilized computer-mediated communication (CMC) rather than traditional SI review sessions. During the Spring 1999 semester, six sections of an introductory computer course were offered via the Internet by a suburban community college district in Texas. Using Campbell and Stanley's Nonequivalent Control Group model, the online SI program was randomly assigned to four of the course sections with the two remaining sections serving as the control group. The students hired to lead the online review sessions participated in the traditional SI training programs at their colleges, and received training conducted by the researcher related to their roles as online discussion moderators. Following recommendations from Congos and Schoeps, the internal validity of the groups was confirmed by conducting independent t-tests comparing the students' cumulative credit hours, grade point averages, college entrance test scores, and first exam scores. The study's four null hypotheses were tested using multiple linear regression equations with alpha levels set at .01. Results indicated that the SI participants earned better course grades even though they had acquired fewer academic credits and had, on average, scored lower on their first course exams. Both the control group and the non-SI participants had average course grades of 2.0 on a 4.0 scale. The students who participated in at least one SI session had an average final course grade of 2.5, exceeding their previous grade point average of 2.15. Participation in one SI session using CMC was linked to a one-fourth letter grade improvement in students' final course grades. Although not statistically significant, on the average, SI

participants had slightly better course retention, marginally increased course satisfaction, and fewer student-initiated contacts with their instructors.

Rodriguez, C. (2001, 2001, September 20). Southern Illinois University hopes new kind of teaching will make more students stay, *Daily Egyptian*.
This newspaper story describes the use of Supplemental Instruction (SI) at Southern Illinois University-Carbondale. Several students are interviewed for the story about the positive benefits of attending SI sessions.

Romoser, M. A., Rich, C. E., Williford, A. M., & Kousaleous, S. L. (1997). Supplemental Instruction at Ohio University: Improving student performance. In P. L. Dwinell & J. L. Higbee (Eds.), *Developmental Education: Enhancing student retention* (pp. 37-44). Carol Stream, IL: National Association for Developmental Education
This study of student performance compared final course grades of students who attended Supplemental Instruction o(SI) study sessions with grades of those who did not attend SI study sessions during the period of Fall 1993 through Spring 1995 at Ohio University (Athens, OH). Results suggested that, with gender and aptitude controlled, students who attended SI study sessions generally finished the targeted course with higher grades and lower rates of withdrawal than students who did not attend, and that frequent attenders (five or more times per academic term in one course) completed courses with final course grades that were generally higher than moderate (two to four times) infrequent (one time only) or non-attenders. For example, during Fall 1994 the following results occurred for higher aptitude students: non SI, 2.55; infrequent, 2.55; moderate, 2.73; and frequent, 2.95. For lower aptitude students for the same academic term: non SI, 1.94; infrequent, 2.09; moderate, 2.27; and frequent, 2.41. Through student evaluations three factors emerged that influenced student attendance: (1) course content must be perceived as challenging, but manageable; (2) cooperating faculty member must endorse both the SI program, SI leader, and encourage students to attend SI; and (3) students must have some understanding of what SI is and what to expect at a study session. A locally-produced SI introductory video has been a helpful promotional took, second only to participant endorsements.

Ross, T. (1995). *Report on Peer Assisted Study Sessions conducted in visual arts, second semester 1995: AASB726, Introduction to Art History*. Unpublished manuscript. Queensland University of Technology. Brisbane, Queensland, Australia.
This report discusses the use of Peer Assisted Study Sessions (PASS), the local institutional name for the Supplemental Instruction (SI) program with students enrolled in an Introduction to Art History course (AAB726). For several reasons, the grades of PASS and non-PASS students were nearly the same. The author suggests that part of the difficulty for the PASS program was that the PASS leaders did not attend class along with the other students. The course curriculum had undergone a significant change between when the PASS leaders attended the same class and when they attempted to provide academic assistance to the students. However, surveys found that PASS leaders found the experience very helpful: improved interpersonal skills (100%); improved learning skills (100%); developed facilitating skills (100%); and developed leadership skills (100%).

Rust, C., & Price, M. (1994). *Improving students' skills through Supplemental Instruction.* Conference Proceedings of the 2nd International Symposium on Improving Student Learning, Oxford, England.
Oxford Brookes University in the United Kingdom is using the Supplemental Instruction program in the School of Business. SI was implemented with larger business courses (400 to 500 students) to enhance the learning environment for the students enrolled in these elective courses that are outside their field of study. Rather than paying the SI leaders, they were given academic credit for the experience. The research studies of students enrolled in the targeted courses suggested a positive correlation ($p < .05$) between SI participation (two or more times) and higher final course grades (Introduction to Business, 61.4 percentile vs. 56.2 percentile for non-SI participants; Managing Concepts, 60.7 vs. 54.6; and Changing Environment of Business, 56.6 vs. 46.2).

Rust, C., & Wallace, J. (Eds.). (1994). *Helping students to learn from each other: Supplemental Instruction*. Birmingham, England: Staff and Educational Development Association
This monograph provides a comprehensive review of Supplemental Instruction in the United Kingdom: overview of SI; background of introduction of SI; use of SI for staff and faculty development; benefits of SI for both the students and the SI leaders; statistical research reports; and eight case studies illustrating the experience of implementing SI into British higher education courses.

Ruth, D. (1987, 1987, March 7). Education bill helped economy, *The Times Picayune,* pp. A-18.
This newspaper article mentions that Supplemental Instruction (SI) is being used at the University of New Orleans with introductory courses in business administration, sociology and Afro-American culture. In these classes students are passing the courses at a rate of 73 percent. Before introduction of SI the pass rate was less than 50 percent.

Rye, P. D., & Wallace, J. (1994). Helping students to learn: Supplemental Instruction. *Student British Medical Journal, 2*, 79-80.
This short article provides an overview of Supplemental Instruction and its use with medical students.

Rye, P. D., & Wallace, J. (1994). Supplemental Instruction: A peer-group learning program for medical undergraduates. *Nordisk Medicin, 109*(11), 307.
This article describes the use of Supplemental Instruction (SI) with Norwegian undergraduate medical students. Various benefits of SI are described for the session participants: study strategies, life-long learning skills, and working in learning teams with other students.

Rye, P. D., Wallace, J., & Bidgood, P. (1993). Instructions in learning skills: An integrated approach. *Medical Education, 27*(6), 470-473.

The transition from school to university education and a medical school environment can be difficult for even the very best students. The article suggests that Supplemental Instruction (SI) would be useful to improvement academic performance of these students. Research studies from Kingston University (Surrey, England) in Computer Science, Electronics and Engineering are cited to suggest the Supplemental Instruction would also be helpful for medical students (62.3 percentile vs. 54.2 percentile for non-SI participants).

Sandmann, B. J., & Kelly, B. K. W. (1979). *Effect of Supplemental Instruction on student performance in a pharmaceutics course*. Unpublished manuscript. University of Missouri-Kansas City. Kansas City, MO.
This investigation sought to determine if Supplemental Instruction (S) would effect student performance in a physical pharmacy course at the University of Missouri-Kansas City. Mean scores on pretest, quizzes, first, second, and final examinations for the two groups (SI and non-SI participants) were compared by conducting a t-test. While scores for the non-SI group remained relatively constant, the SI participant group's academic performance improved throughout the academic term.

Saunders, D. (1992). Peer tutoring in higher education. *Studies in Higher Education, 17*(2), 211-218.
This article describes the development of peer tutoring programs at many institutions in the United Kingdom. Supplemental Instruction (SI) is one of the programs that is being implemented in higher education institutions. Lecturers are being asked to experiment with a greater variety of teaching and learning strategies which complement the lecture tradition. The use of SI at Kingston Polytechnic is mentioned. The benefits of tutoring programs for the tutors are described.

Saunders, D., & Gibbon, M. (1998). Peer tutoring and peer-assisted student support: Five models within a new university. *Mentoring & Tutoring, 5*(3), 3-13.
This article describes the use of Supplemental Instruction (SI) -- called Peer Assisted Student Support (PASS) by the local institution -- in the Business School at the University of Glamorgan in Glamorgan, Wales, United Kingdom. SI has been offered in the School of Applied Sciences since 1991. It is called PASS within the Business School. Most of the PASS group facilitators are volunteers and have previously been participants in groups when they were first year students. Positive reports from facilitators included: satisfaction gained from being able to positively help their peers, improved self-confidence, better communication and oral presentation skills as a result of running sessions, and being able to strengthen their job resume. The author identified several challenges with the PASS scheme: student attendance was erratic due to perceived time conflicts of students; difficulty to maintain the voluntary program as committed PASS facilitators graduated and new leaders needed to be recruited to take over responsibilities.

Sawyer, J. (1990, 1990, October 26). University of Missouri involved in project with South Africans, *St. Louis Post-Dispatch,* p. 15.

This newspaper article provides an overview of the Supplemental Instruction (SI) program as it is being implemented at the University of the Western Cape (UWC) in Cape Town, South Africa. The article reports on trips by UMKC's Larry De Buhr who went to UWC in 1987 and 1989 to help introduce the SI program.

Sawyer, S. J., Sylvestre, P. B., Girard, R. A., & Snow, M. H. (1996). Effects of Supplemental Instruction on mean test scores and failure rates in medical school courses. *Academic Medicine: Journal of the Association of American Medical Colleges, 71*(12), 1357-1359. Correspondence and requests for reprints should be addressed to Dr. Snow, University of Wisconsin Medical School, Dean's Office, 1142 Medical Sciences Center, 1300 University Avenue, Madison, WI 53706-1532.
The purpose of the research study was to determine whether Supplemental Instruction (SI) offered to first-year medical students reduces the number of examination failures. The SI program -- locally called the Medical Scholars Program (MSP) -- was offered at not cost to all first-year students at the University of Southern California School of Medicine in 1994-95. SI sessions were offered in biochemistry, gross anatomy, micro anatomy, and physiology. Mean test scores and failure rates for students considered academically at risk and those not at risk were compared between the class entering in 1994 and the classes matriculating during the preceding three years. Since 85% of students elected to participate in the SI program, it was necessary to compare performance to previous academic terms rather than the non-SI group which was so small as to make same academic term comparisons difficult. At-risk students were defined as those with a total Medical College Admission Test score below 26 and a science grade-point average below 3.0. Comparisons were performed using two-tailed t-tests and chi-square tests. Statistically significant increases in mean test scores were achieved on most examinations by the class exposed to SI. Failure rates for at-risk students decreased by 46% during the year the SI program was offered. The authors listed other outcomes from the SI program: strengthened study strategies that could be used in other courses; students identified gaps in his or her knowledge in advance of examinations; enhanced cooperative rather than competitive interaction with colleagues; hastened development of class camaraderie by broadening the student's circle of friends since they were randomly assigned to the SI groups; and increased student morale and self-esteem since the students experienced less academic failure. SI leaders reported the following benefits of the SI program for themselves: reviewed first-year material in the SI courses which helped them prepare for both the second-year courses and for Step 1 of the United States Medical Licensing Examination.

Schaefer, S., & Hopper, J. (1991). Successful funding and implementation of a biology adjunct. *Journal of College Reading and Learning, 24*(1), 55-62.
This article describes the use of Supplemental Instruction (SI) in an introductory course in biology -- BIO 90, Diversity of Life -- at the University of California, Irvine. SI is offered as a non-credit class that accompanies a specific course. The authors describe the process for gaining support to provide the program: contact with counselors, administrators, and faculty; identified the historically difficult course that needed assistance; wrote a grant proposal; and conducted a pilot test of SI with a limited number of students. Results of the program included: positive relationship between

attendance in SI and final course grade; statistically significant positive change ($p < .01$) from pre- to post-test performance on the Nelson Denny Reading Comprehension Subtest; post-tests in writing showed that students were more likely to answer essay questions with correct answers in complete sentences; and for all the items on the self-assessment of reading, writing, and thinking skills there was a positive, and statistically significant change.

Schecker, F. (1982, 1982, March 29). Program gives boost to students, *The Kansas City Star Newspaper,* p. 3A.
This newspaper article provides an overview of the Supplemental Instruction program at the University of Missouri-Kansas City

Schuldt, G. (1991, 1991, May 15). Group tutoring program a success, *Milwaukee Sentinel Newspaper,* p. 10.
This newspaper article describes the use of Supplemental Instruction (SI) at Milwaukee Area Technical College (WI). Some of the courses that SI is offered include Intermediate Algebra, Introduction to Human Services, Oral Anatomy, Introduction to Occupational Therapy and nine other courses. Data from two courses was reported in the newspaper article. SI participants earned higher mean final course grades than non-SI participants: Oral Anatomy (3.0 vs. 2.2) and Introduction to Occupational Therapy (3.5 vs. 2.3).

Schuss, D. G. (1999, 1999, May 30). Many top college students use tutors to keep an edge: Study sessions aren't just for catching up, *The Boston Globe,* p. D5.
This newspaper article describes the use of Supplemental Instruction (SI) and other forms of academic assistance at highly-selected post secondary institutions such as Worcester Polytechnic Institute, Harvard University, Wellesley College, Dartmouth College, Salem State College, and University of Massachusetts/Amherst. Interviews with campus administrators and students suggested the following reasons for interest in SI and other forms of academic enrichment: maintain top class rankings, improve study strategies, understand class lectures from another perspective, and to improve student persistence towards graduation.

Schwartz, E. B. (1997). Program helps students make the grade. *Key Magazine*.
This short article provides an overview of the Supplemental Instruction (SI) program. The author is the Chancellor the University of Missouri-Kansas City, home of the SI program.

Schwartz, M. D. (1992). Study sessions and higher grades: Questioning the causal link. *College Student Journal, 26*(3), 292-299.
This article contains a data study of the use of Supplemental Instruction (SI) in a large sociology course at Ohio University (Athens, OH). While the study did not reveal statistical significance between SI attendance and final course grade, the students who attended the SI sessions tended to have fewer unexcused absences in the course. In turn, a higher number of unexcused absences was associated with lower course grades.

Sevos, S. (1991). *The effects of Supplemental Instruction on a developmental mathematics course.* (Master's of Science thesis), Kean College of New Jersey.

Shaya, S. B., Petty, H. R., & Petty, L. I. (1993). A case study of Supplemental Instruction in biology focused on at-risk students. *BioScience, 43*(10), 709-711.
The effects of Supplemental Instruction (SI) in Basic Biology I course at Wayne State University (MI) is examined by studying the academic performance of academically at-risk students (low high school grade-point average, low ACT standardized test scores). The SI sessions were open to all students in the course. About 25 percent of the traditional admit students and 40 percent of the at-risk students voluntarily participated in SI sessions during the academic term. The data suggests that SI contributed to higher mean final course grades for SI participants (2.9) vs. nonparticipants (2.4). A separate analysis was conducted to compare the academic performance of at-risk students. At-risk SI participants received higher mean final course grades (2.65 vs. 1.31) and had a higher course completion rate (90 percent vs. 32 percent). To attempt to control for student motivation level, an analysis was conducted of high school grade point averages and ACT scores for SI and non-SI participants among the at-risk students. No significant differences were found. A second analysis for student motivation considered intrasemester SI entry. At-risk students who began to attend SI later in the academic term earned higher mean final course grades than at-risk students who chose not to attend SI. The data suggests that SI participation contributed to the majority of the variance concerning higher mean final course grades.

Shores, P., & Tiernan, J. (1996). *Peer mentor training: A collaborative exercise in systemic change*. Unpublished manuscript. University of Western Sydney at Nepean. New South Wales, Australia. Available: Ms. Penny Shores, Counseling and Health Unit, University of Western Sydney, Nepean, P. O. Box 10, Kingswood New South Wales 2747, Australia
The Learning Center and the Counseling and Health Unit of the University of Western Sydney (Nepean, Australia) have been piloting a Peer Mentor program that is based on the American Supplemental Instruction (SI) program. The SI program is being used an a tool for systemic intervention at the institution by creating an environment for students to change their attitudes. The SI program is being used to serve the increasingly diverse population at the university. Much of the report centered on the training of the SI leaders. Some faculty members also report using the SI program as a feed back mechanism to identify the comprehension level of the students regarding the classroom lectures.

Simpson, M. L., Hynd, C. R., Nist, S. L., & Burrell, K. I. (1997). College academic assistance programs and practices. *Educational Psychology Review, 9*(1), 39-87. Correspondence should be directed to Michelle L. Simpson, Division of Academic Assistance, University of Georgia, Athens, GA 30602.
This comprehensive article provides an overview to academic assistance for college level learning tasks. After examining four critical issues confronting all academic assistance programs (Should generic or content-specific skills be taught? How can

transfer be promoted? What is the role of task and context? What is the role of motivation in self-regulated learning?), the authors examined the goals, assessment procedures, salient features, and program evaluation methods of four prevalent program models: learning to learn course, Supplemental Instruction (SI), required programs for underprepared students, and integrated reading/writing courses. After providing an overview of the SI model, the authors point out that embedded strategy instruction (modeling of study strategies) is a major feature that distinguishes it from many other systems since they employ a direct instructional procedure to teach study skills. The authors concluded by outlining suggestions for future research (e.g., include both descriptive and experimental paradigms, investigate long-term effects, collect both product and process data, seek linkages across disciplines) and by listing specific questions that college students need to ask about the programs at their institutions.

Simpson, S. (1994, 1994, February 23). How to learn by example, *The Scotsman Education,* p. 22.
This newspaper article describes the use of Supplemental Instruction (SI) at Glasgow Caledonian University in Scotland. The local name for the SI program is Peer Assisted Study Sessions (PASS). The article contained interviews with several students who mentioned some of the benefits of the SI program: filled gaps in knowledge; develop strategies to work out their own answers; provided a transition into difficult courses; encouraged students to form their own study groups in other classes were SI was not offered; and helped to deal with the high volume of material.

Skalicky, J. (2008). Providing multiple opportunities for PASS leaders to reflect critically. *Australasian Journal of Peer Learning, 1*, 91-97. Retrieved from http://ro.uow.edu.au/ajpl/vol1/iss1/11
Peer Assisted Study Sessions (PASS) at the University of Tasmania at based on an adaptation of the Supplemental Instruction (SI) model.This articles used Brookfield's framework of critical reflection to consider multiple ways in which PASS programs can embed opportunities for PASS leaders to reflect critically upon their practice. "Critically esponsive teaching is concerned with developing critical thinking in students, encourging them to question assumptions and acquire a mind that is 'sceptical of claims to final trusts or ultime solutions to problems, is open to alternatives, and acknowledges the contextuality of knowledge" (Brookfield, 1990, p. 2) The author advocates for the intentional use of Brookfield's framework during training and as part of the ongoing training/supervision of SI leaders throughout the academic term.

Skalicky, J., & Caney, A. (2010). PASS student leader and mentor roles: A tertiary leadership pathway. *Australasian Journal of Peer Learning, 3*(1), 24-37. Retrieved from http://ro.uow.edu.au/ajpl/vol3/iss1/4.
This articles describes a study of the Peer Assisted Study Sessions (PASS) program which is modeled after the Supplemental Instruction (SI) program. The program also includes PASS mentors as part of the scheme. Data was collected using a structured survey with open-ended questions designed to capture the personal experiences and self-reported learning outcomes of students taking leadership roles withint he PASS program. Twenty-three student PASS leaders and mentors were part of the study.

Twelve themes of leadership development emerged: organization, facilitation, support, attitude, relationships, role model, collaboration, communication, responsibility, decision making, pedagogy, and session management. Students displayed growth as they moved from the initial role as PASS leader to the more demanding role of PASS mentor. The study focused on the experiences of the PASS program at the University of Tasmania.

Sleiman, J. (2008, 2008, May 31). Record-setting 1,509 students graduate AACC, *Maryland Gazette,* p. A 2.
This newspaper article describes a variety of services provided at Anne Arundel Community College to increase student academic success. Supplemental Instruction (SI) is mentioned by one of the students profiled in the article as contributing to her successful grades in a chemistry course.

Smit, D. (1996). *A student's attitude towards skills, adjustment and performance, and the role of Supplemental Instruction.* (Bachelor of Arts thesis), University of Port Elizabeth, Port Elizabeth, South Africa.
This thesis paper examines the use of Supplemental Instruction (SI) at the University of Port Elizabeth (South Africa). A qualitative research design was employed to study the outcomes of the SI program with students regarding attitudes toward skills, adjustment, and performance. The subject of the study was a first year chemistry student. The researcher noted that since SI is a student-driven activity, some academic skills are emphasized based on SI participant interest.

Smith, J. (1998, 1998, September 4). UTA peer program has students helping each other, *Dallas Morning News,* p. 6A.
This newspaper article indicates that Supplemental Instruction (SI) is being used at the University of Texas at Arlington.

Smith, J., May, S., & Burke, L. (2007). Peer assisted learning: a case study into the value to student mentors and mentees. *Practice and Evidence of the Scholarship of Teaching and Learning in Higher Education, 2*(2), 80-109.
Peer-assisted learning (PAL) is a system of student support used in a growing number of universities in the UK and worldwide which is based on Supplemental Instruction (SI). Practitioners in the School of Surveying at Kingston University have been running such a scheme for first-year undergraduates since 1990 (Author 2003) and have recently undertaken a research project into perceptions of PAL by both attendees and mentors. Case study methodology (Tellis 1997) was the chosen research design for the evaluation in which data from focus groups, interviews, and student questionnaires were collected and analysed. The results support much of the previous literature related to PAL/SI schemes, but also highlight gaps which this study may begin to fill. Student perceptions appeared to be clustered into two groups: those who used PAL as a means of managing a comprehension problem (reactive) that had arisen and those that used it as a means of preventing problems (proactive). Additionally, PAL mentors also fell into two groups: those who elected to become mentors for other-centered reasons and those who did so for personal gain. The findings show that both PAL attendees and

mentors perceived a number of benefits from the scheme and that local lessons were learned that enabled the School of Surveying to better support its undergraduate students.

Smith, L. D. (1999). *SI leadership and personal growth: A South African perspective.* Conference Proceedings of the First National Conference on Supplemental Instruction and Video-based Supplemental Instruction, Kansas City, MO.
Many first year students at South African tertiary institutions come from a disadvantaged educational background. They tend to be passive learners and rely on rote memorization rather than understanding. This leaves many ill equipped for the demands of higher education. Although Supplemenal Instruction (SI) provides academic support, its emphasis on students' identifying problems, finding answers and taking responsibility for their learning requires a significant change in approach for both participants and the SI leader. This study documents the benefits of working as an SI leader. Initial attitudes are compared with those developed in the course of a year, by mans of a questionnaire covering self-confidence, self-efficacy, identification with institution, class participation and relationship with lecturers. The personal growth of SI leaders is also compared with that of a group of non-SI cohorts. Employers' perceptions of the responsibility, initiative, creativity and reliability of SI and non-SI graduates are documented.

Smuts, K. B. (1996). The role of student leaders in Supplemental Instruction. *South African Journal of Higher Education, 16*(3), 225-231.
Benefits for the Supplemental Instruction (SI) leaders include: develop a sense of personal adequacy; communication skills; relationship skills; find meaningful use of the subject matter in their own studies; improves their own grades; reinforce their own knowledge of fundamentals; reviw of course material assists them with professional school entrance exams; develop citizenship skills; and skills for the workplace.

Snyders, A. J. M. (1999). *Foundation mathematics for diversity: Whose responsibility and what content?* Conference Proceedings of the Delta '99 symposium on undergraduate mathematics, Whitsunday Coast, Australia.
This article describes the issues facing the University of Port Elizabeth in South Africa regarding instruction in foundation mathematics for an increasing diverse student body. Video-based Supplemental Instruction (VSI) and Supplemental Instruction (SI) have been implemented as part of a comprehensive approach. An extensive review of the professional literature concerning mathematics instruction composes the majority of the article.

Sollerman, J., & Näslund, M. (2003). *Implementation of Supplemental Instruction at the Department of Astronomy: A preparatory study.* Unpublished manuscript. Department of Astronomy, Stockholm University. Stockholm, Sweden.
This report describes a plan to implement Supplemental Instruction (SI) as a new pedagogical tool at the Department of Astronomy in Stockholm University, Sweden. The report is written for the second phase of the course Universitetspedagogik i Teorioch Praktik (University pedagogics in theory and practice), given by the unit for pedagogical

development at Stockholm University. The report authors goal with this publication is to set the stage for the implementation of SI at the department by clarifying how SI can improve the current learning situation. A major objective of this report is to inform the faculty about what SI proposes to do. Due to this emphasis, the report provides a model for other colleges to consider when implementing the SI program for the first time and seeking to gain faculty support. The report also provides historical background about the development and expansion of SI within Sweden. The report concludes with an analysis of extensive surveys of students regarding their potential interest in participating with the proposed SI program.

Sommerfeld, M. (1995). Who's responsible? Taking sides on remedial classes. *Education Week, 14*(29), 1, 14.
This article discusses alternatives to traditional remedial and developmental education programs. Included in the article is a short interview with David Arendale concerning the use of Supplemental Instruction (SI) and Video-based Supplemental Instruction (VSI). One of the difficulties for first-time students is that they concentrate on the wrong things as they prepare for their first examinations.

Sowa-Jamrok, C. (1994, 1994, July 24). Smaller classes attract students, *Chicago Tribune Newspaper,* p. 17.
This newspaper article mentions that Supplemental Instruction (SI) is one of the strategies used at National-Louis University (Chicago, IL) to help students be more active when they are enrolled in large classes. Ofra Peled, who teaches biology and microbiology mentioned that one of the activities used in SI sessions is to have students write about the class lecture material. They write about a lecture concept, discuss it with a few students in a small group, and then after practicing they share about the concept in the next class lecture.

Speed, K. D. (2004). *Perceptions of teaching, teaching practices and effectiveness of Supplemental Instruction leaders and selected students at a Research I institution.* (Ph.D. dissertation), Texas A & M University, College Station, TX. Retrieved from http://www.researchgate.net/publication/26898949_Perceptions_of_teaching_teaching_practices_and_effectiveness_of_supplemental_instruction_leaders_and_selected_students_at_a_Research_I_institution
This study examined students and Supplemental Instruction (SI)leaders perceptions of teaching, teaching practices, and faculty teaching effectiveness. This study also examined the impact of the SI leader's role on those perceptions and subsequent behaviors on end-of-course evaluations and sought to determine whether differences existed between the two groups in order to determine whether or not SI leaders' perceptions should be included in a comprehensive evaluation system. A purposive sample of 17 SI leaders, who had been employed during the spring 2002 semester and returned for the fall 2002 semester, and 17 students, who had attended at least 10 SI sessions during the fall 2002 semester, were selected to participate in this study.Data for the study were collected through individual interviews using a protocol designed to collect their perceptions regarding the following: 1) definitions of teaching and its activities; 2) descriptions of good and bad teaching or good and bad teachers; 3)

definitions and descriptions of faculty teaching effectiveness; 4) role of the SI leader; 5) impact of SI leader's role on perceptions of teaching, its activities, and faculty teaching effectiveness; and 6) impact of SI leader's role on behaviors on end-of-course evaluations. A major finding of this study is that SI leaders and students define teaching and its activities in a similar fashion. SI leaders, unlike students, however, report that learning is tied to teaching effectiveness, or lack thereof. This study has three major results: 1) SI leaders end up teaching, rather than facilitating; 2) the SI leader's role impacts views on teaching; and 3) the SI leaders' role impacts behaviors on end-of-course evaluations. A review of the literature on student ratings of instruction and regular attendance at SI indicate that both correlate, to a small degree, with mean end-of-course grades. Claims of validity with respect to both may be somewhat suspect, in light of SI leader's claims that they teach, rather than facilitate. Investigation of the impact of regular attendance at SI on end-of-course grades and end-of-course evaluations may result in the need to draw new conclusions with respect to validity of student ratings of instruction and SI.

Spencer, C., & Loh, H. (1994). *Improving the learning style of first year Aboriginal & Torres Strait Islander nursing students studying anatomy*. Unpublished manuscript. Conference of Science in Nurse Education. Ballarat, Australia.
This report describes the use in 1994 of Supplemental Instruction (SI) at Queensland University of Technology (Australia) with first year Aboriginal and Torres Strait Islander (A&TSI) students. The local institutional name for the program is Peer Assisted Study Sessions (PASS). Many of these A&TSI students began postsecondary education with high anxiety (79% student response), low to medium confidence in passing their courses, limited knowledge of study skills, and high to moderate difficulty levels within their respective subjects. Based on qualitative research interviews with the A&TSI students, the majority reported they were more confident in passing anatomy after attending the SI sessions. Further, they reported that they were more motivated to perform better and most felt that the SI sessions helped them in developing study skills as their anxiety for the subject decreased.

Spencer, G. (1994). *Supplemental Instruction: Adapt or die?* South African Association for Academic Development Conference. Unpublished manuscript. University of Natal, Durban, Republic of South Africa.
This unpublished manuscript describes the use of Supplemental Instruction (SI) at the University of Natal in South Africa. The SI model has been modified increasing the curriculum development focus potential of the model. Academic Development (AD) and Academic Support (AS)are seen as partners in improving teaching and learning. If AD and AS are seen as opposite ends of the learning continuum, SI is shifted toward the AD end of the continuum line in some South African institutions. Several of the modifications of the SI model include that the academic department: take ownership in administration of the SI program; faculty members take additional time to work with the SI leaders; faculty members recognize that changes need to be made regarding instructional delivery and content selection; faculty members modify their course delivery based on common themes of student comments; and key senior faculty

members become highly involved in the SI program an ensuring that curriculum develop occurs.

Spencer, G., & Wallace, J. (1994). Conceptualizing Supplemental Instruction. In C. Rust & J. Wallace (Eds.), *Helping students to learn from each other: Supplemental Instruction, SEDA Paper 86* (pp. 9-14). Birmingham, England: Staff and Educational Development Association
This article places Supplemental Instruction into its appropriate role within British higher education. SI is compared and contrasted with collaborative learning, tutorials, and roles of the instructor. It is emphasized that SI focuses on the student learning process.

Spofford, T. (1990, 1990, October 1). Top students pitch in to lower dropout rates: Peer-run study groups help keep freshmen in college, *The Times Union Newspaper,* pp. A1, A12.
This newspaper article provides an overview of the Supplemental Instruction (SI) program at the State University of Albany (Albany, NY), Hudson Valley Community College (Troy, NY), The College of Saint Rose (Albany, NY), Rensselaer Polytechnic Institute (Troy, NY), and Skidmore College (Saratoga Spring, NY). Some data from some of the programs and interviews with SI Supervisors and SI leaders also is included. Institutions reported a variety of compensation systems for the SI leaders. At SUNY they receive three college credits. Most others paid an hourly wage of $5.00 to $6.00. At Rensselaer the SI leaders receive $1,100 a year, free meals, and a $500 discount on a room in the freshman dormitory.

Staff. (1987). Redefining an attrition risk. *Recruitment and Retention in Higher Education Newsletter, 1*(3), 6-7.
This newsletter article provides an overview of the Supplemental Instruction (SI) program. It contains interviews with Deanna Martin, creator of the SI program, and May Garland who directs SI training workshops. Garland suggests that SI can help bridge students from developmental education into the regular courses in the curriculum.

Staff. (1989). New Mexico program targets at-risk classes. *National On-Campus Report, 17*(2), 3.
The newsletter article provides an overview of the Supplemental Instruction (SI) program as it is being implemented at the University of New Mexico in introductory chemistry and biology classes during 1988. Data suggests a half a letter grade higher final course grades for SI participants.

Staff. (1990, 1990, November 19). Education student gets SCUP of reality at Westport High, *University News (Student newspaper of the University of Missouri-Kansas City),* p. 4.
The newspaper article describes the use of Supplemental Instruction (SI) with high school students enrolled in English and history classes at an urban high school in Kansas City, MO. Students from the UMKC School of Education were some of persons who served as SI leaders. The article contains an interview with an education major who commented on the positive impact of the experience of working with high school

students early in the education degree program rather until the field teaching experience in a school as an upper level student.

Staff. (1990, 1990, August 16). UMKC program improves grades, retention of students in college, *Kirksville Daily Express,* p. 1.
This newspaper article provides a basic overview of the Supplemental Instruction (SI) program.

Staff. (1991, 1991, March 12). Making the grade: Supplemental Instruction program lets students help other students learn, *The Oscoda County Herald,* p. 14.
This newspaper article provides an overview of the Supplemental Instruction (SI) program at Kirkland Community College (MI). Data from SI sessions in biology and chemistry during Fall 1990 suggest that SI participants earned higher mean final course grades than non-SI participants (chemistry: 2.25 vs. 1.22; biology: 2.56 vs. 1.22).

Staff. (1991, 1991, February 14). Supplemental Instruction program aims to help students earn better grades, *The Blue and White Flash: Jackson State University Newspaper,* p. 4.
The newspaper article provided an overview of the Supplemental Instruction (SI) program that is being implemented at Jackson State University (MS) in the following academic areas: art, English, history, mass communication, music, and urban affairs.

Staff. (1992, 1992, July 29). College 'mini-grants' awarded, *San Jose Mercury News,* p. 3.
This newspaper article describes 14 grants that were awarded by the San Jose/Evergreen Community College District to teachers for projects to help improve classroom instruction and student services at their colleges. The grants were created to stimulate innovation and creativity, especially in the areas of staff diversity, recruitment of underrepresented groups, retention, and new technologies and enrollment reduction caused by budget restraints. Susan L. Smith received a special grant for Supplemental Instruction.

Staff. (1993). Academic programme at Queensland University of Technology well supported. *The Chinese Business and Professional Association of Queensland Newsletter*, 20-21.
This newsletter article describes the use of Peer Assisted Study Strategies (PASS) at Queensland University of Technology (Brisbane, Queensland, Australia). PASS is the local institutional name for Supplemental Instruction (SI). The article cites the PASS program as one of the projects that contributed to QUT being selected as Australia's University of the Year in 1993. Benefits reported for PASS participants include reduction of the failure rate and increased student motivation and confidence. PASS leaders listed the following benefits for them: developed personal character and leadership skills, improving their own learning skills, improved their facilitating techniques, acquired group management and presentation skills, and built their self-confidence and self-esteem. Ron Gardiner and Henry Loh are cited as the early leaders of the PASS project.

Staff. (1993). Academic programme at QUT well supported. *The Chinese Business and Professional Association of Queensland Newsletter, 47*(66).
This newsletter article describes the use of Supplemental Instruction (SI) at the Queensland University of Technology (Brisbane, Australia).

Staff. (1993, 1993, September 28). US experts focus on teaching strategies, *Inside QUT (Queensland University of Technology Newspaper),* p. 2.
This newspaper article describes the upcoming arrival of Deanna Martin and Robert Blanc from the University of Missouri-Kansas City to conduct a Supplemental Instruction (SI) Supervisor training workshop at Queensland University of Technology (Brisbane, Australia). The visit to QUT will be supported by the Higher Education Research and Development Society of Australasia. SI is recognized at QUT as one of the teaching strategies which helped the university win the national Good Universities Guide 1993 University of the Year award.

Staff. (1994, 1994, June 4). SAU's tutoring gets high ratings, *Banner-News,* p. 15.
The newspaper article mentions that Supplemental Instruction (SI) program is an important part of academic support services at Southern Arkansas University. Preliminary results from the Noel-Levitz Student Satisfaction Inventory suggested that students were very high in comparison with other institutions in the U.S. SAU was one of the institutions that participated in the national survey.

Staff. (1994). Supplemental Instruction. *South Carolina Association of Developmental Educators Newsletter*, 3.
The newsletter article provides an overview of the Supplemental Instruction (SI) program.

Staff. (1995, 1995, July 18). New learning process to help first-year University of Southern Queensland students, *The Chronicle Newspaper,* p. 8.
The newspaper article describes the use of Supplemental Instruction (SI) at the nursing department at the University of Southern Queensland in Australia. In the article Deanna Martin, creator of the SI model, provided an overview of the SI program while she was visiting the university.

Staff. (1995, 1995, August 17). Sessions help students conquer classes with high failure rates, *Omaha World-Herald Newspaper,* p. 28.
This newspaper article describes the use of Supplemental Instruction (SI) at the University of Nebraska-Lincoln.

Staff. (1995, 1995, August 2). Students helping boost pass rates, *The University of Southern Queensland Newspaper,* p. 5.
This newspaper articles describes the implementation of Supplemental Instruction (SI) at the University of Southern Queensland at Toowoomba in the Nursing Department during Fall 1995. In addition to describing the academic benefits to the SI participants, the USQ SI coordinator, David Anderson, reports that a value for SI leaders is that the

experience provides leadership development and increases their post-graduate opportunities.

Staff. (1995). Supplemental Instruction equals science success. *Recruitment and Retention in Higher Education Newsletter, 9*(8), 9.
This newsletter article describes the use of Supplemental Instruction (SI) at the University of Wisconsin. The researchers from UW studied why the teaching of science discouraged women from pursuing academic degrees in the area. SI was cited as a supportive learning environment that was different than the one experienced in the classroom. Several suggestions for faculty members: build a comfortable classroom culture; provide collaborative learning activities; accept students' uncertainties about the content material; confirm the capacity of students to learn; and personalize science so that students see the connections between the content and their personal lives.

Staff. (1995, 1995, July 7). Survey shows many study hours wasted, *Campus Review*.
This newspaper article describes the use of Supplemental Instruction (SI). It mentions that the SI program has been adopted for use in several Australian institutions: University of Southern Queensland in Toowoomba, University of Queensland, and the Queensland University of Technology.

Staff. (1996). Georgia's HOPE: A system in transition. *Black Issues in Higher Education, 13*(15), 10-13, 16.
This article describes Georgia's HOPE (Helping Outstanding Pupils Educationally) program to improve academic success of its college students. Dr. Stephen Portch serves as Chancellor of the University of Georgia System and Atty. Juanita Baranco is Regent with the University of Georgia System. Both are interviewed in this article. Portch suggests that Supplemental Instruction (SI), with its focus on at-risk courses rather than at-risk students, allows student to earn higher grades without labeling them in the process or continuing the previous system of remedial education that retaught material from high school.

Staff. (1996, 1996, August 30). It makes sense to protect that first year's investment, *Lincoln Journal Star,* p. 7.
This newspaper article describes the use of Supplemental Instruction (SI) to increase academic success of students the University of Nebraska - Lincoln. The article contains interviews with the administrators and their reasons for implementing the SI program.

Staff. (1996, 1996, September 24). Wayne State University retention efforts help students stay in school, *Michigan Chronicle Newspaper,* p. 10A.
This newspaper article describes the use of Supplemental Instruction (SI) at Wayne State University (Detroit, MI).Wayne Excel, the university's comprehensive retention program model was implemented in fall 1991. Excel provides a high level of advising and academic support services for at-risk students during their first two years at WSU. SI is one of the components of the Excel program. Institutional research shows that student retention has increased since the Excel program was started.

Staff. (1997, 1997, August 19). Engineering course lifts grades and retention rates, *Inside QUT (Queensland University of Technology, Australia),* p. 2.
Dr. Martin Murray from Queensland University of Technology in Australia is using Peer-Assisted Study Sessions (PASS) to improve student performance in engineering courses. PASS is the locally used name for the Supplemental Instruction (SI) program. PASS was one of several new additions to the course delivery system that both increased student academic achievement but also lowered the cost of instruction.

Staff. (1997). Supplemental Instruction and minority students. *Journal of Developmental Education, 20*(3), 38.
This article describes a national research study of Supplemental Instruction (SI) with students of color. Students of color participated in SI at rates equal or exceeding those for White students (White, 33.3%; African-American, 42.0%; Hispanic-American, 50.9%; Asian-American, 33.3%; and Native-American, 42.9%). Students of color who participated in SI earned higher mean final course grades (2.02 vs. 1.55) and lower rates of D, F and withdrawal rates (36% vs. 43%) than similar students who did not.

Staff. (1998). 1998 exemplary programs show how six campuses address pressing issues. *NASPA Forum, 20*(2), 7-10.
The National Association for Student Personnel Administrators (NASPA) conducted a national competition to identify exemplary programs located on postsecondary campuses that meet pressing issues. The Supplemental Instruction (SI) program from the University of Missouri-Kansas City was recognized through this process. This article provides a short overview of the SI program.

Staff. (1998, 1998, January 16). Supplemental Instruction program at UMKC leads the way, *Inside UMKC Newsletter,* p. 1.
This newsletter article describes how the Supplemental Instruction program was featured at a conference hosted by the U.S. Department of Education called "Replacing Remediation in Higher Education" that was hosted at Stanford University on January 26-27, 1998. SI was one of only five programs to be presented at the invitation-only conference.

Staff. (1999). *Supplemental Instruction in engineering courses: An analysis of student participation*. Unpublished manuscript. University of North Carolina Charlotte. Charlotte, NC.
This report is an excerpt from the final report of a 1998-1999 study conducted on Supplemental Instruction (SI) in a high-attrition "gateway" engineering course at the University of North Carolina-Charlotte. After SI was introduced to UNC in 1985 within the College of Arts and Sciences, it quickly spread throughout the institution. Preentry attributes of the students in the study included ethnicity, gender, Grade Point Average, Predicted Grade Index, SAT scores, class, and academic major. SI participants were defined as those who attended five or more SI sessions during the academic term. There was no significant differences between SI and non-SI participants except for a slightly higher Predicted Grade Index for the SI participants. This was attributed to the possible impact of higher student motivation of the SI participants.

Staff. (2008, 2008, December 14). OUM's Ng helps put the fun back in Mathematics, *New Straits Times,* p. 22.
[Richard Ng], who is the Open University Malaysia director of the Perak Learning Centre, initiated a Maths project, which culminated in a research paper entitled "E-Mathematics: Pre-instructional and Supplemental Instruction and their Impact on Students' Online Participation and Final Exam Score." "I have tweaked the idea to enable online SI coordination. Though the fundamentals are the same, this is more flexible as the learners need not have face-to-face interaction. I am glad to see the increase in learners' online involvement and activities," said Ng, who specializes in Maths, E-Commerce and Marketing.

Staff. (n.d.). Australasian National Centre for Supplemental Instruction/PASS Web Site, Retrieved from http://www.uow.edu.au/student/services/pass/centre/index.html
The UOW PASS program has received extensive national and international acclaim. Click here for a list of the awards the program has received. Since 2005, the UOW PASS Program has also been accredited by the International Center for Supplemental Instruction (SI), UMKC as the National Centre for PASS/SI in Australia. Hundreds of staff from dozens of institutions around the Australasian region have benefited from training and assistance delivered by PASS@UOW. UOW is also host for the Journal of Peer Learning, the premiere journal for scholarly publications related to peer learning including SI and PASS.

Staff. (n.d.). Canadian National Center for Supplemental Instruction Web Site, Retrieved from http://www.canadiansi.uoguelph.ca/
In 2008, the University of Guelph was designated as the Canadian National Centre for Supplemental Instruction by the University of Missouri Kansas City, home to the International Center for Supplemental Instruction. Krista Bianco is a Certified Trainer in Supplemental Instruction, and oversees the following activities of the National Centre: Delivery of Certified SI Supervisor Training and other professional development opportunities; Liaison with existing Canadian SI Programs, and with the International Center for SI; Support and dissemination of research and evaluation initiatives as well as press coverage related to SI in the Canadian context; and Consultation services with institutions from across Canada that are implementing or considering the SI model on their campus

Stansbury, S. L. (2001). Accelerated Learning Groups enhance Supplemental Instruction for at-risk students. *Journal of Developmental Education, 24*(3), 20-22, 24, 26, 28, 40. Available from the author at Sydbury@Yahoo.com.
In order to increase Supplemental Instruction (SI) attendance, Accelerated Learning Groups (ALGs) were developed. A pilot study investigated whether at-risk students who participated in an ALG/SI combination demonstrated higher self-efficacy and SI attendance than those who participated in only SI. Results suggested that at-risk students were more likely to participated in 12 or more SI sessions if they attended an ALG/SI combination than if they attended only SI. In addition, the range of final grades was higher for those who attended an ALG/SI combination than for those who attended

only SI. The development of prerequisite skills was essential for the efficacy of SI to serve academically underprepared students who may shun the very academic intervention that would be of most help to them. Additional research is warranted to investigate this area.

Stansbury, S. L. (2001). *How to turn Supplemental Instruction nonparticipants into participants*. Unpublished manuscript. University of Missouri-Kansas City. Kansas City, MO. Available from the author at Sydbury@Yahoo.com
This study investigated the outcomes of the Supplemental Instruction (SI) model with 215 students enrolled in General Biology and 200 students in General Chemistry at the University of Missouri-Kansas City. A variety of preentry attributes were collected from the students including self-reported grade in a previous course of the same academic sequence, mastery goal orientation, performance-approach goal orientation, performance-avoidance goal orientation, self-efficacy, and interest in group study. While the findings were complex, several general statements include: higher SI attendance was correlated with higher final course grades, academically weaker students were less likely to attend SI sessions, academically weaker students reported higher levels of self-efficacy suggesting that they were less likely to accurately assess their strengths and weaknesses. This may also partly explain why these students were less likely to participate in SI sessions. The author recommends that the course professor administer a content-valid pretest during the first class period to provide feedback to all students and hopefully motivate the low scoring students to attend SI sessions. The paper concludes with an overview of Accelerated Learning Groups (ALGs), an intervention designed by the author at the University of Southern California to increase the academic success of at-risk students. The objective of ALGs is to identify students who have below average prerequisite skills for a course and assist them in strengthening these skills while they attend SI. ALGs were designed to work simultaneously with the campus SI program. Procedures for implementing ALGs is provided with data from a study of the effectiveness of ALGs in a chemistry course.

Stansbury, S. L. (n.d.). *Beyond the Supplemental Instruction summary report*. Unpublished manuscript. University of Missouri-Kansas City. Kansas City, MO. Available from the author at Sydbury@Yahoo.com
This handout was used during training workshops conducted by the SI Director of Research and Training. Going beyond the descriptive statistics that were the baseline reporting system, Dr. Stansbury presents a variety of research methods to study SI more deeply to understand the impact of SI. In particular, the role of prior academic achievement and the frequency of SI attendance were critical to understand whether SI was making a statistically significant difference for the participating students regarding their final course grades.

Stenseth, C. A. (2005). *The relationship between Supplemental Instruction and locus of control among college students.* (Ph.D. dissertation), Minnesota State University Moorhead, Moorhead, MN.

Stephens, J. E. (1994). Supplemental Instruction in developmental mathematics. *Supplemental Instruction Update*, 1-2.
Based on a research study concerning the use of Supplemental Instruction (SI) with developmental mathematics courses at Tarleton State University (Forth Worth, TX), the data suggests the following: attendance at SI sessions is correlated with the perceived level of academic challenge in the course; academic achievement of SI participants is correlated with the level of activity in the SI sessions; if there is extensive verbalizations of the thinking process by SI session attendees, females will tend to have higher achievement than males; and if there is low levels by SI participants of vocalizing the thinking process the academic achievement is similar for males and females.

Stephens, J. E. (1995). A study of the effectiveness of Supplemental Instruction on developmental math students in higher education [Dissertation, University of North Texas, 1995]. *Dissertation Abstracts International, 56*(05), 1697A. (University Microfilms, No. 9529947).
This quasi-experimental doctoral dissertation research study examined the effects of participation in a Supplemental Instruction (SI) program on student test performance in a second-level developmental mathematics class in a four-year university setting (rural North Central Texas, 6300 FTE) during Spring 1994. The research design followed Campbell and Stanley's Nonequivalent Control group Model (1963) with repeated measures. This research deviated from past research on SI in that it examined effects of the SI program at the end of each of six test blocks rather than at the end of the course only. Test data were analyzed using analysis of variance; final course grades were analyzed using chi-square. Interview notes combined with notes on classroom behavior patterns and SI study session behaviors added to the ethnographic aspect of the study. Results showed that the SI students scored higher on unit tests throughout the semester, and this difference in scores became significant as the semester progressed (Score range: 0 to 100; Exam #1: 67.8 vs. 66.3; Exam #2: 78.97 vs. 74.34; Exam #3: 69.0 vs. 59.03; Exam #4: 84.13 vs. 54.02; Exam #5: 83.03 vs. 68.34; Final Exam: 68.77 vs. 51.35. Exams beginning with #3 were statistically significant ($p < .01$). The rate of A or B final course grades was higher for the SI group (36.6% vs. 6.7%). The rate of D and F grades (24.1% vs. 52.0%), course withdrawals (11.0% vs. 28.0%), and combined rate of D or F final course grades and withdrawals (35.4% vs. 80.0%) was lower for SI participants. Additional analysis examined the impact of low, medium and high attendance at SI sessions. These categories are defined as attending one-third, two-thirds, or all SI sessions during the examination period. Only in two of the six examination blocks was attendance found to be statistically significant (Exam #3 mean scores of SI participants: low, 62.7; medium, 75.33; high, 83.0. Exam #4: low, 78.33; medium, 88.42; high, 96.0). Overall percentage of SI participation grew throughout the academic term: exam #1, 18.7%; exam #2, 36.2%; exam #3, 46.7%; exam #4, 42.3%; and exam #5, 53.2%. Observations regarding behaviors during the SI sessions included: it took time before students became active and verbal participants; students began to understand error patterns revealed during unit examinations; problem solving skills increased; increased ability to explain thinking process regarding problem-solving; discovery of multiple approaches to problem-solving; the group developed camaraderie; and the emergence of several SI participants as subgroup leaders. Observations

regarding behaviors during class lectures by SI participants found that after several weeks they began to ask more questions to the instructor concerning lecture material.

Stephens, J. E. (1995). Supplemental Instruction in developmental mathematics: Inquiring minds want to know. *Journal of Developmental Education, 19*(2), 38.
Based on the author's dissertation research concerning Supplemental Instruction (SI), the following observations concerning SI in math were made: (1) the developmental math student participants in SI in relationship to their perceived level of difficulty of the course instructor; (2) SI program success is dependent upon the level that students are active in SI sessions; (3) when the variable of repetition is applied to SI and non-SI participant, higher academic success is associated with first-time course students; (4) when the variable of gender is applied to SI and non-SI participant when there has been a high level of vocalization during SI sessions, females tend to increase more highly in academic terms than males; (5) when the variable of gender is applied to SI and non-SI participant when there has been a low level of vocalization during SI sessions, academic achievement will be fairly equal among the genders.

Stiles, T. (1985, 1985, November 6). Study guides help freshmen take note of differences in learning at college, *Chicago Tribune Newspaper,* p. 2.
This newspaper article provides an overview of the Supplemental Instruction (SI) program. The article discusses the transition shock experienced by many former high school students who were academically successful at the secondary level but are now facing academic difficulty in the more rigorous college environment. Deanna Martin, creator of the SI program, is quoted in the article.

Stockly, S. K. (1996). *Closing the gap in technical skills: Supplemental Instruction and Mexican-American undergraduate women*. Unpublished manuscript. Annual Meeting of the Southwestern Sociological Association. Houston, TX.
This quasi-experimental study in Spring 1994 examines the performance of Mexican American women in an Introductory Economics course (Economics 302, Principals of Macroeconomics) at the University of Texas at Austin. Supplemental Instruction (SI) was offered as an academic enrichment program for students. SI participation rates were higher for women than men and students of color when compared with White students. The data suggest that SI participation had a positive correlation with increased mean final course grades in all comparison groups except Asian American women (White: men, 2.84 vs. 2.37 and women, 2.77 vs. 2.06; African American: men, 1.60 vs. 1.50 and women, 3.00 vs. 1.25; Asian American: men, 3.20 vs. 2.46 and women, 2.78 vs. 3.00; Hispanic: men, 2.10 vs. 1.60 and women, 2.38 vs. 1.46; and all students: 2.68 vs. 2.19).

Stockly, S. K. (2000). Performance of minority students in economics: An econometric evaluation of Supplemental Instruction [Dissertation, University of Texas at Austin, 1999]. *Dissertation Abstracts International, 60*(12), 4541.
The scarcity of minority scholars in Economics is well-recognized, though few studies have addressed the issue. This dissertation identifies the introductory coursework in economics as a significant stumbling block for African American and Hispanic students

and analyzes the effects of an extensive Supplemental Instruction (SI) program initiated to improve minority student achievement in these courses. Data were collected for over 9,000 students enrolled during two academic years, 1990-1991 (prior to the inception of SI) and 1993-1994 (after the program was fully operational). The data include independent variables that measure or proxy student-specific characteristics, academic maturity, relative high school quality, and institutional characteristics. Econometric testing of probit and ordered logit models indicate that minority students earn average grades that are significantly lower than those earned by their non-minority counterparts. Decomposition methodology, derived from analysis of wage differentials in Labor Economics, is used to quantify the gap in average grades into proportions that are explained and unexplained by the data. The analysis of the effects of SI on student performance reveals that women and minority students attend the adjunct sessions at higher rates than other students and that students who chose to participate in the program earn average grades that are significantly higher than those earned by students who either chose not to participate or were in course sections where SI was not available. Use of the decomposition methodology to control for the effects of self-selection indicates the SI program offers real value added. Students in the data set were followed for up to four years after the targeted semesters, allowing for an analysis of the long-term effects of participation in SI. Probit and ordered logit models tested whether SI enhanced student interest in taking additional coursework in economics, whether students who participated in SI were then able to achieve significantly higher scores in subsequent coursework, and whether the skills gained through participation in SI helped students achieve higher retention and graduation rates. Overall, the effects of SI in the longer term are positive and statistically significant.

Stone, M. E., & Jacobs, G. (Eds.). (2006). *Supplemental Instruction: New visions for empowering student learning*. New Directions for Teaching and Learning, No. 106, San Francisco: Jossey-Bass
This sourcebook includes the following chapters: 1. The impact of Supplemental Instruction on teaching students "how to learn," Saundra Yancy McGuire. 2. The basic SI model,.Maureen Hurley, Glen Jacobs, Melinda Gilbert. 3. Supplemental Instruction at community college: The four pillars, Joyce Ship Zaritsky, Andi Toce. 4. A credit-bearing course for training SI leaders, Sally A. Lipsky. 5. Video-based Supplemental Instruction: Serving underprepared students, Maureen Hurley, Kay L. Patterson, F. Kim Wilcox. 6. Benefits to Supplemental Instruction leaders.M. Lisa Stout, Amelia J. McDaniel. 7. How Supplemental Instruction benefits faculty administration, and institutions, Sandra Zerger, Cathy Clark-Unite, Liesl Smith. 8. New directions for Supplemental Instruction, Sonny L. Painter . 9. TeamSI : A resource for integrating and improving learning, Carin Muhr, Deanna C. Martin. 10. The New vision for SI: Where are we heading ? Glen Jacobs, Marion E. Stone, M. Lisa Stout.

Stone, M. E., & Jacobs, G. (Eds.). (2008). *Supplemental Instruction: Improving first-year student success in high-risk courses* (Monograph No. 7, 3rd ed.). Columbia, SC: University of South Carolina, National Resource Center for the First-Year Experience & Students in Transition

This monograph explores the Supplemental Instruction (SI) model through the following chapters: (introduction) 35 years of SI, F. Kim Wilcox and Glen Jacobs; (1) basic SI model, Maureen Hurley and Melinda Gilbert; (2) research on the effectiveness of SI, Maureen Hurley and Melinda Gilbert; (3) theoretical frameworks that inform the SI model, Sandra Zerger; (4) implementing a new SI program, F. Kim Wilcox; (5) recruiting and training SI leaders, Amelia McDaniel; (6) strategies for adapting SI to specific academic disciplines, Sandra Zerger; (7) Video-Based SI, Maureen Hurley, Kay Patterson, Sonny Painter, and Jennifer Carnicom; (8) SI international adaptations and future directions, Glen Jacobs M. Lisa Stout, and Marion E. Stone; (9) Concluding the first 35 years, Amelia McDaniel; (appendix a) glossary of terms; (appendix b) selected annotated bibliography for SI, David R. Arendale

Stone, M. E., Jacobs, G., & Hayes, H. (2006). Supplemental Instruction: Student perspectives in the 21st century. In D. B. Lundell, J. L. Higbee & I. M. Duranczyk (Eds.), *Student standpoints about access programs in higher education* (pp. 129-141). Minneapolis, MN: Center for Developmental Education and Urban Literacy, University of Minnesota.Retrieved from http://education.umn.edu/CRDEUL/publications.html.
This qualitative study was conducted with Supplemental Instruction (SI) participants at the University of Missouri-Kansas City. Themes that emerged regarding the positive benefits of SI included: better organization of course material, reinforcement of major concepts, clarification of questions asked identification of key concepts, learning in a "safe" environment, opportunity to voice understanding., exposure to other perspectives, deeper understanding, and increased confidence. Several themes emerged regarding challenges with the SI model. These included: unproductive SI sessions, SI leaders did not reteach the course material, sometimes received contradictory or confusing information, and some expressed dissatisfaction with peer cooperative learning. SI leaders were also a part of the qualitative study. Themes that emerged included: leadership development, study strategy development, opportunity to teach, deeper content knowledge, and development of relationships.

Stout, B., & Wiatr, J. (2001). Getting started with Supplemental Instruction (SI). *The Learning Center Newsletter*. Retrieved from http://www.learningassistance.com/2001/Jun01/index.htm.
This article begins a series in this newsletter devoted to establishing an Supplemental Instruction (SI) program on a campus. The authors directed the SI program at the University of Pittsburgh (PA). A variety of administrative issues are explored concerning the establishment and smooth running of the SI program.

Stout, B., & Wiatr, J. (2001). Supplemental Instruction (SI): Department to SI program dynamics. *The Learning Center Newsletter*. Retrieved from http://www.learningassistance.com/2001/Jul01/index.htm.
This article describes the efforts by the campus Supplemental Instruction (SI) coordinators at the University of Pittsburgh (PA) to develop their program and gain campus support. Recommendations are made how to effectively approach academic departments and their faculty members regarding the introduction of SI to the courses.

Stout, B., & Wiatr, J. (2001). Supplemental Instruction (SI): More on recruiting SI leaders. *The Learning Center Newsletter*. Retrieved from http://www.learningassistance.com/2001/Dec01/index.htm.
This article describes the strategies used at the University of Pittsburgh to attract and retain group leaders to work with their Supplemental Instruction (SI) program.

Stout, B., & Wiatr, J. (2001). Supplemental Instruction (SI): Recruiting SI leaders. *The Learning Center Newsletter*. Retrieved from http://www.learningassistance.com/2001/Aug01/index.htm.
The authors from the University of Pittsburgh make a number of recommendation on strategies for recruiting Supplemental Instruction (SI) leaders. The process for selection is a rigorous one to identify the most appropriate student for the role due to the high demands placed upon the position.

Stout, B., & Wiatr, J. (2001). Supplemental Instruction (SI): Training SI leaders. *The Learning Center Newsletter*. Retrieved from http://www.learningassistance.com/2001/Nov01/index.htm.
The authors describe the procedures that they followed at the University of Pittsburgh in training the Supplemental Instruction (SI) leaders. The training program included both an intensive workshop before the beginning of the academic term, but also follow-up sessions. These included clinical supervision observations by the campus SI coordinator as well as requiring SI leaders to view sessions run by fellow student leaders to gain more perspectives on how to facilitate their own groups.

Stout, B., & Wiatr, J. (2002). Supplemental Instruction (SI): Evaluating the SI program. *The Learning Center Newsletter*. Retrieved from http://www.learningassistance.com/2002/Feb02/SI.htm.
This article suggests some simple quantitative research procedures to collect data and provide a rudimentary evaluation system for Supplemental Instruction (SI).

Stout, B., & Wiatr, J. (2002). Supplemental Instruction (SI): Faculty support and the SI program. *The Learning Center Newsletter*. Retrieved from http://www.learningassistance.com/2002/Jan02/SI.htm.
This article explores the relationship between the Supplemental Instruction (SI) program and the faculty member that sponsors it with their class. The authors provide a history of the development of SI at the University of Pittsburgh (PA). Also the authors describe the use of SI as a faculty development strategy for faculty members who request the feedback from the SI leader.

Stout, B., & Wiatr, J. (2002). Supplemental Instruction: Developing an SI proposal. *The Learning Center Newsletter*. Retrieved from http://www.learningassistance.com/2002/Mar02/SI.htm.
This article describes some strategies for gaining and managing financial support for a Supplemental Instruction (SI) program. The authors cite the need to develop a comprehensive funding plan to support all aspects of an SI program.

Stout, M. L., & McDaniel, A. J. (2006). Benefits to Supplemental Instruction leaders. In M. E. Stone & G. Jacobs (Eds.), *Supplemental Instruction: New visions for empowering student learning* (pp. 55-62). New Directions for Teaching and Learning, No. 106. San Francisco: Jossey-Bass
This chapter explores the many benefits that accrue to Supplemental instruction (SI) leaders as a result of their participation: academic competency, improved communication and relationship-building skills, enhanced personal development such as higher self-confidence and self-esteem, and enhanced professional development such as leadership skills, teamwork strategies, verbal and written expression, and self-assurance.

Stratton, C. B. (1998). Transitions in Developmental Education: Interviews with Hunter Boylan and David Arendale. In P. L. Dwinell & J. L. Higbee (Eds.), *The Role of Developmental Education in Preparing Successful College Students* (pp. 25-36). Columbia, SC: The National Association for Developmental Education and the National Center for the Study of the Freshmen Year Experience and Students in Transition
In this book chapter the author interviews two leaders in the field of developmental education. Hunter Boylan directs the National Center for Developmental Education. David Arendale directs national dissemination of Supplemental Instruction. Both have served as past presidents of NADE. Arendale talks about how developmental education must be "mainstreamed" into the college curriculum rather than continuing with the current model of separate tracks of courses and support for students who need academic assistance. Supplemental Instruction and Video-Based Supplemental Instruction are cited as examples for embedding academic assistance into college-level courses. Brief overviews are provided for both programs. He suggests that SI and VSI present an acceptable way for accomplishing the mission of developmental education which is politically acceptable to policy makers at the institution, state, and national level.

Stratton, C. B., Commander, N. E., Callahan, C. A., & Smith, B. D. (1996). *From DS to LS: The expansion of an academic preparation program from developmental studies to learning support.* Conference Proceedings of the National Association for Developmental Education, Little Rock, AR.
With increased emphasis on student retention, a model for expanding academic support through Supplemental Instruction was developed to provide a comprehensive program for a larger population at Georgia State University (Atlanta, GA). Research studies suggested that SI participants earned higher mean final course grades. In addition, students whose predicted success (based on SAT scores and a formula predicting GPA) was low outperformed their peers predicted to be more successful.

Stratton, C. B., Commander, N. E., Callahan, C. A., & Smith, B. D. (2001). A model to provide learning assistance for all students. In V. L. Farmer & W. A. Barham (Eds.), *Selected models of developmental education programs in higher education* (pp. 63-88). Lanham, NY: University Press of America
Supplemental Instruction (SI) ed at Georgia State University, an urban institution with 25,000 students. Due to changing institutional policies, the emphasis was shifted from

a traditional developmental education program that focused on the lowest academically prepared students to a campus program that served students from all academic ability levels. SI was a key component of the new mission. Academic achievement data is reported in classes where SI was offered to all students: accounting, biology, history, and political science between 1994 and 1997 and the results favored SI participants. The book chapter reports on a variety of other adjunct instructional approaches to providing academic enrichment for a broader scope of students and the administrative issues that guided the decision making with this change.

Sulski, J. (1991, 1991, January 6). Keeping minorities in college. Schools growing more sensitive to students' needs, *Chicago Tribune Newspaper,* p. 4.
This newspaper article mentions that Supplemental Instruction (SI) is one of the activities that is used to improve student achievement of Hispanic students. The Latin American Recruitment and Educational Services (LARES) program is directed by Leonard Ramirez at the University of Illinois at Chicago. SI is a component of the LARES program to help students develop their study strategies and writing skills.

Sultan, F. K. P. D., Narayansany, K. S., Kee, H. L., Kuan, C. H., Manickam, M. K. P., & Tee, M. Y. (2014). Helping students with difficult first year subjects through the PASS Program. *Journal of Peer Learning, 6*(1), 59-75. Retrieved from http://ro.uow.edu.au/ajpl/vol6/iss1/6.
The purpose of this action research was to find out if participants of a pilot PASS program found it to be helpful. The PASS program is based on the Supplemental Instruction (SI) model. The program was implemented for the first time in an institute of higher learning in Malaysia. An action research design guided the study, with surveys, documents, and reflections as primary data sources. The findings were largely positive, with participants citing PASS sessions to have helped them in the study of difficult first year subjects and in the development of some study skills. PASS also improved social integration. The collaborative and facilitated structure of PASS sessions were reported to be key aspects that improved student learning. Some issues were also highlighted and discussed, such as misconceptions of the role of PASS leaders.

Sutton, K. (1994, 1994, February 5). Deanna Martin aids University of Port Elizabeth to chop failure rate, *Eastern Providence Herald Newspaper,* p. 7.
This newspaper article contains an interview of Deanna Martin who is creator of the Supplemental Instruction (SI) model. The interview describes the development of the SI model in the United States and its implementation at institutions worldwide. Included is a description of the role of Dr. Andre Havenga in developing the program at the University of Port Elizabeth in South Africa.

Synco, T. M. (2012). *Background or experience? Using logistic regression to predict college retention.* (Ph.D. dissertation), University of Alabama at Birmingham, Birmingham, AL.
Tinto, Astin and others have researched the retention and attrition of students from college for more than thirty years. However, the six year graduation rate for all first-time full-time freshmen for the 2002 cohort was 57%. This study sought to determine the

retention variables that predicted continued enrollment of entering freshmen at a large urban, four-year, public institution. Logistic regression was utilized to analyze the data collected over a four-year period. The population studied was 1,346 first-time full-time freshmen entering fall 2007. The variables chosen for analysis were ACT composite, cumulative GPA and high school GPA, ethnicity, gender, Pell eligibility, unmet financial need, advising, early alert notices, engagement and freshman year experience courses, honors participation, change of major, campus housing, and supplemental instruction. Data were analyzed by year of enrollment through spring 2011. Correlation studies eliminated the threat of multicollinearity. The logistic regression models passed goodness-of-fit tests for Hosmer Lemeshow, Omnibus Test of Coefficients, and Cox and Snell and Nagelkerke. The analyses found that ACT Composite, cumulative GPA, advising, ethnicity, engagement courses, change of major, and supplemental instruction were predictors for retention. In year one, two, three and four each one point raise in GPA increased the likelihood of persistence by 3.99, 3.31, 3.52, and 11.60 times, respectively. In year one and two students who were White were 2.29 times and 1.74 times more likely to persist, respectively. Living on campus and having advising appointments in the first year increased the likelihood of persisting by a factor of 1.46 and 1.21, respectively. Changing major in the first year increased the likelihood of returning by a factor of 4. In the fourth year, each change of major decreased the likelihood of persisting by a factor of .62; having a higher ACT composite score decreased the likelihood of persisting while Supplemental Instruction sessions increased the likelihood of persisting. Investigative efforts to validate the coding of participation in freshmen year experience courses found large discrepancies between the reported and actual frequency counts reported by the system. A need to audit and correct student information system data related to retention variables was noted.

Taksa, I., & Goldberg, R. (2004). Web-delivered Supplemental Instruction: Dynamic customizing of search algorithms to enhance independent learning for developmental mathematics students. *Mathematics and Computer Education, 38*(2), 152-164. Supplemental Instruction (SI) was modified for web delivery to increase its use and effectiveness of results for students. The focus was on serving developmental math students at the City University of New York.

Tanaka, C. (1995). *Peer Assisted Study Sessions in HUB 661 Japanese*. Unpublished manuscript. Queensland University of Technology. Brisbane, Queensland, Australia. This research report documents the use of Peer Assisted Study Sessions (PASS) at Queensland University of Technology (Brisbane, Queensland, Australia) in HUB 661 Japanese language course. This course is often chosen as a second-semester, first year subject for International Business students. PASS is the local institutional name for the Supplemental Instruction (SI) program. Benefits of the PASS program for participants included slightly higher mean final course grades and lower rates of withdrawal. The professor who had PASS attached to his class reported receiving helpful feedback from the PASS leader concerning the comprehension level of the students. This afforded them an opportunity to revise lectures and review upcoming examinations. PASS leaders reported the following behavioral changes: learned how to give feedback to the course lecturer in an appropriate fashion; learned to work in harmony with other students and leaders; improved their own communication skills; improved their content knowledge and skill; and gained valuable insight into the learning process.

Tangwe, M. N., & Rembe, S. (2014). The perceptions of students on the implementaiton of peer academic support programmes at one university in South Africa. *Mediterranean Journal of Social Sciences, 5*(4), 378-389. Retrieved from http://mcser.org/journal/index.php/mjss/article/viewFile/2225/2211.
The general concern regarding the high dropout and low throughput rates at previously disadvantaged universities led to the establishment of academic support programmes. The paper examines the perceptions of undergraduate students regarding the implementation of the Supplemental Instruction and language and writing consultant programmes at one university in South Africa. The findings reveal that these programmes are very useful and helpful to undergraduate students though there are some shortcomings that need the attention of the administration of the university. In this regards, some recommendations are presented in order to ameliorate the implementation of these cherished programmes

Taylor, G. T., Healy, C. E., & Macdonald, M. (1994). Engineering educational development: Raising the quality through partnerships. In J. Wallace (Ed.), *Kingston University HEFCE Supplemental Instruction Project* (pp. 225-230). London, England: Kingston University
The changes which face education today make it essential that quality is raised by moving from a teaching to a learning culture. Supplemental Instruction (SI) was used to create a partnerships between student, staff and employers working together to develop a learning environment in the Department of Energy and Environmental Technology at Glasgow Caledonian University in Glasgow, England. Students indicated the following reasons for SI participation: students want to work in peer groups; students recognize the academic difficulty of their courses; and students believe that peer groups are a source of information and help for them. In an evaluation of the SI program, SI leaders indicated growth in the following areas: verbal and nonverbal communications, learning techniques, interpersonal communication skills, consideration of college major change to a teaching career, and gaining employment skills that makes them more attractive to potential employers.

Terrion, J. L., & Daojust, J.-L. (2011). Assessing the impact of Supplemental Instruction on the retention of undergraduate students after controlling for motivation. *Journal of College Student Retention: Research, Theory and Practice, 13*(3), 311-327.
The University of Ottawa (UofO) in Ottawa, Canada offers a formal Supplemental Instruction program, called the residence study group program (RSGP), to residence students registered in first year courses that are associated with a high degree of failure or attrition. The objective of this study was to assess the impact of this program by comparing a sample of first year residence students who participated in the RSGP with a sample who did not participate. The study compared final grades of students in these courses after controlling for personal motivation and found that while those who participated in the RSGP did not receive higher final grades than non-participants, they

were more likely to persist in their studies. It appears that the RSGP contributes in many important ways to the academic and social integration of first year students and these are critical to persistence beyond the first year.

Thomas, L., Quinn, J., Slack, K., & Casey, L. (2002). Student services: Effective approaches to retaining students in higher education of Work. of Work. Department. Institute for Access Studies, Staffordshire University. Stoke-on-Trent, United Kingdom. Bournemouth University in the United Kingdom describes its Peer Assisted Learning (PAL) program which is based upon Supplemental Instruction (SI) on page 51 of this directory of programs used at postsecondary institutions in England to meet needs of students to support their persistence towards graduation.

Thomas, L., Quinn, J., Slack, K., & Casey, L. (2003). Effective approaches to retaining students in higher education: Directory of practice of Work. of Work. Department. Institute for Access Studies, Staffordshire University. Stoke-on-Trent, United Kingdom. Bournemouth University in the United Kingdom describes its Peer Assisted Learning (PAL) program which is based upon Supplemental Instruction (SI) on page 51 of this directory of programs used at postsecondary institutions in England to meet needs of students to support their persistence towards graduation.

Thompkins, C. D. (2001). Learning to facilitate construction of understanding: A case study of Supplemental Instruction leaders [Dissertation, North Carolina State University, 2001]. *Dissertation Abstracts International, 62*(01), 70.
The purpose of this study was to investigate the verbal interactions between Supplemental Instruction leaders and students within the context of Supplemental Instructions sessions to acquire an understanding of how dialogue exchanges were established and maintained over the course of a semester. Three novice Supplemental Instruction leaders were selected for this study. Their classes were observed and recorded throughout the semester through the use of audio and video recordings and observer field notes. Their beliefs about teaching and learning, their rationale for making instructional decisions and their perceptions about their students' learning were identified through the use of interviews. A socio-constructivist perspective was used to frame and interpret the findings of the study. This perspective embraces the idea that students not only construct knowledge individually, they construct knowledge socially through interactions with others by establishing a sociocultural system. This system establishes the norm for how classroom interactions will occur. Analysis of verbal interchanges that took place over the semester in each of the SI leaders' classrooms indicated that the type of talk that occurred in two SI leaders' sessions changed, resulting in an increase in student involvement. No differences in exchanges over the semester were found for the third SI leader. The factors that seemed to most strongly influence how SI leaders led sessions were their initial beliefs about teaching and learning and their perceptions of students' needs. The factors found to affect implementation of instructional strategies were the numbers of students attending the session, the immediate stated and observed needs of the students and the pedagogical inexperience of the SI leaders. The findings of this study indicated that the three SI leaders respective belief systems ultimately determined what went on in SI sessions.

Although all three had the same SI training and initially indicated that they would actively involve students, only two SI leaders were eventually able to do this.

Timmermans, S. R., & Heerspink, J. B. (1996). Intensive developmental instruction in a pre-college summer program. *The Learning Assistance Review, 1*(2), 32-44.
This article describes a modification of the Supplemental Instruction (SI) model at Calvin College (Grand Rapids, MI) to take into account the cognitive and developmental factors of high school students. This instructional component was placed in a pre-college summer program called Intensive Developmental Instruction (IDI). Unique features of IDI include: high school students are placed in college-level classes beyond their current level of academic ability; the SI leader is a certified K-12 teacher from outside the course area who takes the class along with the high school students; and explicit instruction is provided by the IDI leader in learning strategies. A comparison was made between the IDI high school students and the college students in the same classes who did not participate in IDI. It was assumed that the college students were stronger academically than the high school students since their mean ACT score was higher (24 vs. 20 for IDI students). IDI students received a grade of C or higher 88.7 percent of time compared with 80.6 percent for the college students. Results from the Learning and Study Strategies Inventory suggest that their involvement in IDI improved their use of learning strategies.

Tonsetic, R., & Warren, B. Z. (1997). *Assisting faculty and students in adjusting to large class environments*. Unpublished manuscript. University of Central Florida. Orlando, FL.
This paper discusses the use of Supplemental Instruction (SI) at the University of Central Florida (27,000 students) as one component in dealing with helping faculty and students deal with large classes. In Spring 1997 39 classes had an enrollment of 200 or more students. During Fall 1996 SI was provided for four large class sections including a chemistry course for non-science majors. SI participants earned a higher mean final course grade (3.39 vs. 1.72). When adjusted for differences in SAT scores, the SI group still received higher grades (2.54 vs. 1.71). The percent of A and B final course grades was higher for the SI group (47% vs. 20%) as well as lower rates of D, F or course withdrawals (18% vs. 56%). Positive results were also reported for the SI in general biology and American national government. There were no significant differences in the calculus course. While there was high satisfaction with the SI participants, the grade differences were not significant. The authors suggest that the SI sessions in math need modification for more effective use. In addition, the authors administered several personality instruments for additional research. The Student Behavior Checklist (Long, 1985) examined the Long Reactive Personality Types with the SI participants and generated the following results: aggressive-independent (16%); aggressive-dependent (48%); passive-independent (8%); and passive-dependent (16%). Using the Long Personality Traits instrument the following results were generated concerning the SI participants: phobic (31%); compulsive (69%); impulsive (15%); and hysteric (32%).

Topping, K. J. (1996). The effectiveness of peer tutoring in further and higher education: A typology and review of the literature. *Higher Education, 32*(3), 321-345.

The increasing use of peer tutoring in British higher education necessitates a clear definition and typology. Through an extensive review of the literature, the author discusses peer tutoring in general with a short review of and the Supplemental Instruction (SI) program. Research studies from both the U.S. and U.K. suggest that participation in SI is positively correlated with higher mean final course grades. Other UK studies suggested improved communication skills and deeper understanding of the curriculum occurred for SI participants and higher grades for the SI leaders themselves.

Turner, M. (2004, 2004, October 2). $3M grant helps students with learning, teaching, *The Modesto Bee,* p. A 22.
This newspaper article describes how Supplemental Instruction (SI) is being implemented to support academic success of students but also provide a professional development experience for the SI leaders. The article contains quotations from SI program administrators and SI leaders. One of the leaders describes how serving as a SI leader provided insight to a potential teaching career.

United Press International. (1990, 1990, August 16). UMKC program improves grades, retention of students in college, *Kirksville Daily News,* pp. 1-2.
The newspaper article carried by United Press International (UPI) provides a short overview of the Supplemental Instruction (SI) program.

Urban, C. Q. (2005). *The effects of using computer-based distance education for Supplemental Instruction compared to traditional tutorial sessions to enhance learning for students at-risk for academic difficulties.* (Ph.D. dissertation), George Mason University, Fairfax, VA.
The purpose of this study was to investigate the effects of using computer-based distance education (CDE) Supplemental Instruction compared to traditional tutorial sessions (TS) to enhance learning for students at-risk for academic difficulties. The research question guiding this study was: Does using computer-based distance education for supplemental instruction prove comparable to, or better than, traditional tutorial sessions to enhance learning for baccalaureate nursing students at risk for academic difficulties? Two hypotheses were generated based on this question. Previous studies had suggested that using computer-based distance education for supplemental instruction was an effective method to enhance student learning. Moore's theory of transactional distance (1993) supports using CDE methods that provide adequate structure and dialogue to decrease the amount of transactional distance and enhance learning. Research Hypothesis 1 stated that adult students attending a classroom lecture course augmented by supplemental instruction provided by computer-based distance education (CDE) would demonstrate a higher change score between a knowledge-based posttest and pretest than their cohorts attending weekly traditional tutorial sessions (TS). There were no significant differences noted on 2-way ANOVA testing based on method or risk category between the experimental (CDE) and control (TS) and Research Hypothesis 1 was not supported. But with the exception of the TS not at-risk student group, all CDE groups had higher mean change scores than their cohorts. Research Hypothesis 2 stated that adult students accessing computer-based distance education (CDE) supplemental instruction would score higher on five

separate unit exams given throughout the course than their cohorts attending weekly traditional tutorial sessions (TS). Only two tests resulted in a significant difference on 2-way ANOVA testing. There were significant differences between both the method (CDE/TS group) and for the risk category "not at-risk" on only two exams and Research Hypothesis 2 was only partially supported. For most exams, both WebCT(TM) and Tutorial groups had an increase in score of at least one point (2% points) when compared to the total class mean with the WebCT(TM) group scoring up to two points higher (4% points) than the Tutorial group and one point higher than the total class mean. While Research Hypothesis 1 was not supported and Research Hypotheses 2 was only partially supported, the increases noted in the mean scores for both the CDE and TS groups have positive practical implications for a student at risk for academic difficulty. Computer-based distance education for Supplemental Instruction may be viewed as comparable to traditional tutorial sessions and provides students with flexible options for learning.

Utah State University. (2008). SI leader training manual, Retrieved from http://www.usu.edu/arc/supplemental_instruction/pdf/SI_Manual.pdf
This is a training manual developed at Utah State University for training of its Supplemental Instruction (SI) leaders.

Van Der Karr, C. A. (2001). Becoming a cooperative learner: Supplemental Instruction experiences at a community college [Dissertation, Syracuse University, 2000]. *Dissertation Abstracts International, 62*(04), 1347.
This study is an exploration of the Supplemental Instruction experience at a community college. The study was designed to gain a better understanding of these peer lead study groups grounded in the perspectives of students. The community college was located in the northeast and served 8000 full time, part time, and continuing education students. The qualitative design included data collection via participant observation, individual interviews, group interviews, and review of related materials over the course of a semester. The students described a cooperative environment built upon shared values, goals, and expectations. This environment included norms around appropriate behavior, creating a safe environment, and protecting the group culture. Within this group environment and culture, students described perceptions and patterns of shares authority framed through the role of the leader. Authority was a fluid point on a continuum between high leader authority and high shared authority in group. Authority was presented through three domains of leadership: social leadership, administrative leadership, and content leadership and students and group leaders both resisted and promoted shared authority. The students engaged in this negotiated authority in different ways related to their personal perspectives and experiences. They described critical perspectives that relate to their patterns of participation in the groups. As students described higher levels of participation in group, they also described shifts in their perceptions of themselves as learner, peers, relationship to content, and locus of control. The participants of this study explained how Supplemental Instruction served as an opportunity to engage in content within a social context. The social engagement not related to higher content understanding; it provided a form of involvement for students whose involvement was often limited by other life roles and responsibilities. The findings

support the critical role peers and cooperative learning have in student learning, satisfaction, integration, and persistence. The findings also suggest dimensions to cooperation that may yield design that is more effective, implementation, and assessment of group learning.

van der Meer, J., & Scott, C. (2008). Shifting the balance in first-year learning support: From staff instruction to peer-learning primacy. *Australasian Journal of Peer Learning, 1*, 70-79. Retrieved from http://ro.uow.edu.au/ajpl/vol1/iss1/9
At the University of Otago, New Zealand, peer-learning is critical for enhancing student learning outcomes and improved effectiveness of student learning support centers. This paper argues that a shift must occur from a instruction focus of learning support to a focus on peer learning. This increases student engagement and increased learning outcomes.Peer Assisted Study Sessions (PASS) programs are popular approaches to increasing student academic succes.

van der Meer, J., & Scott, C. (2009). Students' experiences and perceptions of Peer Assisted Study Sessions: Towards ongoing improvement. *Australasian Journal of Peer Learning, 2*(1), 3-22. Retrieved from http://ro.uow.edu.au/ajpl/vol2/iss1/2
This study focused on understanding students' reasons for participating in Peer Assisted Study Sessions (PASS), a variation of the Supplemental Instruction (SI) model. The study also reviewed the student perceptions of the effectiveness of the program operating at a college in Australia. The survey of students who participated in PASS revealed the following: improve course grade; complete the course with a passing grade; be less likely to drop out of the institution; increased satisfaction with the course; improved their study-skill development; wanted more classes to have the PASS program attached to them; and other feedback used by the researchers with improvement of the training program of the PASS leaders.

van Hamburg, E. (1998). Leerfasilitering in kontakonderrig. *Didaktikom, 19*(1), 1-4.

Van Lanen, R. J., & Lockie, N. M. (1992). *Addressing the challenge of student diversity: Impact of Supplemental Instruction on performance in a freshman level chemistry course*. Unpublished manuscript. Saint Xavier University. Chicago, IL.
The paper is based on the results of a pilot research study designed to determine the effect of Supplemental Instruction (SI) attendance on the performance and retention of a diverse student population in Chemistry 108 for various levels of SI attendance and to determine relationships between demographic and academic variables of the sample and participation in SI. The sample consisted of Saint Xavier University (Chicago, IL) students enrolled in Chemistry 108 (N=61) in Fall, 1990 and Spring, 1991. Significant differences in performance in Chemistry for the SI group and the non-SI group, as measured by final course grades, were observed when the SI group was defined as students attending six or more SI sessions and the non-SI group was defined as students attending five or fewer SI sessions. Both academic variables and the demographic variables were compared for the SI group and for the non-SI group.

Van Lanen, R. J., & Lockie, N. M. (1997). Using Supplemental Instruction to assist nursing student in chemistry: A mentoring program's support network protects high-risk students at Saint Xavier University. *Journal of College Science Teaching, 26*(6), 419-423.
This article discusses the use of Supplemental Instruction (SI) with nursing students in Principles of Organic and Biochemistry (Chemistry 108) at Saint Xavier University (IL). Chemistry 108 is the second class in a two-semester introductory chemistry course designed for freshman nursing students. After a basic overview of the SI model, the article discusses a research study to examine the effectiveness of the SI program. The Chemistry 108 class was composed mainly of women (94.5%), transfer students (75.8%), and nursing majors (95.1%). It was equally distributed between students above and below age 23. In this study SI participants were defined as students who attended six or more times. The SI group received a higher mean final course grade (2.52 vs. 2.21) and a lower rate of D, F and course withdrawals (14.3% vs. 29.1%). The authors postulate that due to the variety and complexity of skills needed to understand chemistry -- complex content mastery, language, and problem solving -- higher levels of SI attendance are needed to show more consistent positive academic results. Three themes emerged from SI participants concerning why they felt SI was helpful: (1) working out problems on the black board; (2) opportunity to share information; and (3) chance to help each other.

Van Lanen, R. J., Lockie, N. M., & McGannon, T. (2000). Predictors of nursing students' performance in a one-semester organic and biochemistry course. *Journal of Chemical Education, 77*(6), 767-770.
Saint Xavier University, Illinois, has identified predictors of nursing students' performance in a one-semester organic and biochemistry course. Early identification of predictors of performance would allow for intensive academic advising and implementation of specific academic support strategies appropriate to the student's needs. Data were collected over 7 semesters from 308 undergraduate students enrolled in Chemistry 108, about half of whom were traditional students and half were continuing education students. Three predictor variables were identified for the traditional group: mathematics placement test score, total number of supplemental instruction sessions attended, and Chemistry 107 grade. Two predictor variables were identified for the continuing education group: Chemistry 107 grade and Nelson Denny reading test score, which assesses understanding of written vocabulary and mastery of reading comprehension.

Vanmali, B. H. (2012). *Assessing assessment: How use of the concept inventory of natural selection influences the instructional practices of an experienced biology professor and Supplemental Instruction leader.* (Ph.D. dissertation), University of Missouri-Columbia, Columbia, MO.
https://mospace.umsystem.edu/xmlui/bitstream/handle/10355/33113/research.pdf?sequence=2
Assessment has garnered increased interest in recent years. It is seen as critical to enhancing student learning and understanding. Formative assessment tools such as concept inventories could be valuable in moving toward such goals. Concept

inventories, a recent addition to biology education, hold much promise for helping faculty to understand the preconceptions their students hold and therefore, how to design lessons to better support students' conceptual change processes. While these are the hopes of the developers of concept inventories, no one has examined what professors and other academic professionals actually do with results of the concept inventories. Likewise, academic support programs such as Supplemental Instruction have gained attention as mechanisms by which to help students improve understanding and increase achievement. Much research has touted the efficacy of Supplemental Instruction programs. However, little research has examined the mechanisms by which those learning gains are attained. Do innovations such as concept inventories help improve teaching and learning? How are they used and what can we learn from the experiences of faculty and academic support professionals who use them? Would learning improve if concept inventories were utilized in an academic support environment such as Supplemental Instruction? This study used interviews with an experienced biology professor and an experienced Supplemental Instruction Leader to examine how they used the collective results of the Concept Inventory of Natural Selection (CUB, used as a pre- and post test) to design and implement lessons in a large lecture introductory biology course and in Supplemental Instruction sessions. Using observations and document analysis as supporting data, themes were identified that describe these educators' views of learning, knowledge of assessment principles, and knowledge of assessment interpretation and action taking. This study provides the first data for how concept inventories are interpreted by faculty and Supplemental Instruction Leaders and used to guide instructional planning and implementation. Data analysis revealed that an experienced biology professor did not rely on the diagnostic pre-assessment tool (the CINS) to understand and act upon students' prior knowledge and misconceptions. Rather, she was already aware of common student misconceptions and prepared to help students modify their knowledge. Instead, she preferred to rely on such instruments as a tool to help students self-assess the status of their knowledge. Likewise, this experienced Supplemental Instruction Leader was also aware of students' misconceptions and prepared to work with students to revise their understandings prior to receiving the results of the CINS pre-assessment. She relied on a variety of formative assessment tasks to help students build their knowledge and periodically check their understandings in a collaborative, small group environment. This study sheds light on areas of strength as well as needed professional development and education for faculty members and Supplemental Instruction Leaders. It provides the first data on how concept invent ories may be used in the biology classroom and in Supplemental Instruction sessions. It also identifies areas of educator knowledge where more understanding and research is greatly needed by the teacher educator community.

Vasquez, S. (2000). How to structure a Supplemental Instruction session: Daily agendas and semester goals. *NCLCA Newsletter*, 8-8.
Supplemental Instruction (SI) programs typically employ undergraduate students to serve as SI leaders. Sometimes their inexperience leads to less productive SI sessions for the participants. Adding structure to the SI sessions can assist novice SI leaders until they gain experience and confidence to respond more quickly to needs presented

by students attending the SI sessions. A suggested agenda is: identify common questions of the students; engage students in a preplanned collaborative learning activity; focus on the most important concepts covered in the class lecture and textbook; and answer questions that have not been answered by the aforementioned Si session activities.

Villén, V. (2002). *How to prevent student drop outs? An example from Lund University.* (Master's of Arts thesis), Pedagogical Institution, Lund University, Lund, Sweden.
This Master Thesis (written in Swedish) describes how Lund University in Sweden is implementing a variety of programs to deal with student drop outs. Two programs featured in the manuscript are Supplemental Instruction and Video-based Supplemental Instruction.

Visor, J. N., Johnson, J. J., & Cole, L. N. (1992). The relationship of Supplemental Instruction to affect. *Journal of Developmental Education, 16*(2), 12-14, 16-18.
This Supplemental Instruction study that examined college students enrolled in an introductory psychology course conducted at Illinois State University (Normal, IL) addressed the following questions: a) Are students who elect to participate in SI affectively different from those who choose not to do so? b) does SI affect a positive change in noncognitive factors for participants? The noncognitive factors examined were locus of control, self-efficacy, and self-esteem. Results suggested that those who participated regularly in SI were affectively different from those who participated only occasionally or not at all. SI participants tended to have a higher internal locus of control and higher self-esteem than others. The researchers suggested that this may have been due to the manner in which the SI program was promoted to students. Self-efficacy actually decreased for the more frequent SI participants. The researchers suggested that these students may have developed a more accurate understanding of their strengths and weaknesses while the others were "blissfully ignorant of what it takes to succeed." Increased sensitivity by the SI leader may be needed to effectively meet the needs of "at-risk" students (external locus of control, low self-efficacy, and low self-esteem). The authors suggest additional research is needed regarding non-cognitive variables.

Visor, J. N., Johnson, J. J., Schollaet, A. M., Good-Majah, C. A., & Davenport, O. (1995). *Supplemental Instruction's impact on affect: A follow-up and expansion.* Conference Proceedings of the 20th Annual Conference on Developmental Education, Chicago, IL.
Following up a previous study (Visor, Johnson, and Cole, 1992), the authors sought to determine whether positive change in certain affective variables was associated with participation in Supplemental Instruction (SI): locus of control, the feeling of being in charge of one's own destiny; self-efficacy, beliefs about one's ability to succeed at a given task; and self-esteem. Students from an introductory psychology course at Illinois State University (Normal, IL) were studied in fall of 1994. Students were divided into three categories of participation: regular participants (4 or more times during the term); occasional participants (1 to 3 times); and nonparticipants. The data suggested the following trends. Among freshmen, regular participants tended to have (a) higher self-

esteem than nonparticipants, (b) greater self-efficacy than nonparticipants, and (c) greater internal locus of control than nonparticipants and occasional participants. Among upperclassmen, regular participants tended to have (a) higher self-esteem, (b) greater self-efficacy, and (c) greater internal locus of control than nonparticipants and occasional participants. A causal relationship between SI participation and these affective changes is difficult to empirically establish due to confounding demographic variables.

Vorozhbit, M. P. (2012). *Effect of Supplemental Instruction on student success.* (Master of Science thesis), Iowa State University, Ames, IA.
Supplemental instruction (SI) was developed in the late 1970s but many institutions still do not realize academic benefits of this program. The analysis of the data collected at a large public research university in the Midwest, demonstrated that the final course grade for all three courses is higher for SI-participants than for non-participants. At the same time, the SI participants on average have lower ACT score than the non-participants. Moreover, the final course grade positively correlates with the number of SI sessions attended meaning that the more SI sessions the students attend the higher grade they receive for the course.

Waimon, D. A. (1999). *The impact of Supplemental Instruction on student graduation records.* (Master's of Science thesis), Illinois State University, Normal, IL.
This study investigated Supplemental Instruction (SI) at Illinois State University (Normal, IL) for first time students who enrolled during Fall 1993 regarding its impact on student graduation records (graduation rates at the end of the fourth and fifth year of college and grade point averages upon graduation from the university). The students were enrolled int he following classes: psychology, economics, communication, science, history, and problem solving. Preentry attributes studied were ACT composite score and high school percentile rank standing. The three findings of the study were: SI participants have better graduation records than their non-SI participants; students who attend more SI sessions during their first year have better graduation records than students who attend fewer; and students who start SI first semester of the first year fare no better in their graduation records than students who do not participate in the program until second semester of their first year (though first semester SI participants earned higher grade pint averages upon graduation than those who did not participate until the second semester).

Wallace, J. (1992). Students helping students to learn. *The New Academic, 1*(2), 8-9.
This article describes the use of Supplemental Instruction (SI) at Kingston University in London, England. In addition to reports of improved academic performance by SI participants, interviews with SI leaders suggest they had the following results: higher final course grades in other subjects, increased leadership skills, higher confidence levels, and increased contact with faculty members.

Wallace, J. (1993). *The use of Supplemental Instruction in sub-degree vocational courses*. Unpublished manuscript. Kingston University. Surrey, England.

This report describes the use of Supplemental Instruction (SI) with sub-degree vocational courses at Kingston University (London, UK). Kingston runs a number of sub-degree courses leading to the Higher National Diploma (HND) in Electronic Engineering which is obtained from the Business and Technology Education Council (BTEC) through the university. In October, 1990 SI was introduced into several courses in the Faculty of Technology at Kingston. Data from 1990 to 1991 suggests that SI participants received statistically ($p < .05$) higher final course grades (Mathematics: 60.9 percentile vs. 48.1 percentile; Circuits & Systems: 64.0 vs. 49.9; Electronic Principles: 60.0 vs. 49.4; Software Principles: 55.3 vs. 41.5; and Management Studies: 69.4 vs. 53.5). and had lower rates of withdrawal. In addition, interviews with SI participants suggest that they also develop "transferable skills" that help them in other courses.

Wallace, J. (1994). *Kingston University HEFCE Supplemental Instruction Project: 1993-94*. Unpublished manuscript. Kingston University. London, England.
This report review four years of development and research into the use of Supplemental Instruction at Kingston University in the United Kingdom. An additional emphasis area for the SI model has been with staff and faculty development. Included are reports from Kingston University, Glasgow Caledonian University, University of Central Lancashire, Luton University, University of Brighton, and Oxford Brookes University.

Wallace, J. (1994). Provoking the teaching and learning debate. In J. Wallace (Ed.), *Kingston University HEFCE Supplemental Instruction Project* (pp. 99-117). London, England: Kingston University
This chapter contains responses from several educators regarding the impact of Supplemental Instruction (SI) with improving the learning environment for college students in the United Kingdom. The SI program has attracted considerable attention from student unions and unionized teacher trade unions since it has become another partner in the learning process. UK educators who have implemented the SI program have been very careful to position SI as an enhancement to the learning process rather than an alternative to traditional means of delivering instruction to students. Teaching and learning are carefully separated with the UK system.

Wallace, J. (1995). Supplemental Instruction: Students helping each other with their learning. *UCoSDA Briefing Papers, 20*, 1-4. Available: UCoSDA, Level Six, University House, Sheffield, England S10 2TN.
This paper provides an overview of the Supplemental Instruction (SI) model as it is implemented in the United Kingdom. In addition to the traditional purposes of the SI program, there are two additional emphasis areas for the SI program. First, SI leaders are expected to feed back to the course professor students comments (e.g., relevance of instructional pace, understanding of the lecture material, relevance of support materials such as handouts). SI leaders receive special training to delicately share this information with the faculty members. The second emphasis area is on staff and educational development. Faculty members are encouraged to make adjustments of their teaching behaviors to accommodate the needs of the students.

Wallace, J. (1996). Peer tutoring: A collaborative approach. In S. Wolfendale & J. Corbett (Eds.), *Opening doors: Learning support in higher education* (pp. 101-116). London, England: Cassell Publishers
This chapter is a description of how the Supplemental Instruction program was customized for use in the United Kingdom. The key to the success of the program was effective awareness raising for academic staff, the training of the student leaders and the effective management of the scheme. Quotations from SI leaders and faculty members cite a variety of reasons for support for the SI program.

Wallace, J. (Writer). (1996). Supplemental Instruction: A profile of the scheme [Videotape]. In G. Mair (Producer). Glasgow, Scotland: Glasgow Caledonia University
This videotape provides an overview of the implementation of Supplemental Instruction (SI) in the United Kingdom. Jenni Wallace, Certified Trainer for the United Kingdom, provides a historic perspective of SI's use in the United Kingdom. Following is an interview with two SI leaders (Paul Irwin and Mel Dobie) concerning benefits of the SI program to the SI leaders: increased leadership skills, improved use of study strategies, higher confidence level, and increased content knowledge.

Wallace, J. (Writer). (1996). Supplemental Instruction: The challenging way forward [Videotape]. In G. Mair (Producer). Glasgow, Scotland: Glasgow Caledonia University
This videotape provides an overview of the implementation of Supplemental Instruction (SI) in the United Kingdom. It contains an interview with two SI leaders (Paul Irwin and Mel Dobie) concerning benefits of the SI program to the SI leaders: increased leadership skills, improved use of study strategies, higher confidence level, and increased content knowledge.

Wallace, J. (1999). *SI supporting quality in higher education in the United Kingdom.* Conference Proceedings of the First National Conference on Supplemental Instruction and Video-based Supplemental Instruction, Kansas City, MO.
This article examined how the American SI model has been modified to work with the United Kingdom postsecondary education system in more than thirty institutions. In addition to traditional measures of effectiveness of the SI program regarding student academic performance, the UK SI model is seen as a contributor to supporting educational quality. A government agency called the Quality Assurance Agency reviews institutions much in the same way as American regional accrediting agencies. SI is seen as contributing to high achievement of all six performance measures: curriculum design, content, and organization; teaching, learning, and assessment; student progression and achievement; student support and guidance; learning resources; and quality management and enhancement.

Wallace, J., & Rye, P. D. (1994). What is Supplemental Instruction? In C. Rust & J. Wallace (Eds.), *Helping students to learn from each other: Supplemental Instruction, SEDA Paper 86* (pp. 7-8). Birmingham, England: Staff and Educational Development Association
This article provides a short overview for how the Supplemental Instruction program is most often implemented in the British higher education system.

Wambach, C. A., Brothen, T., & Dikel, T. N. (2000). Toward a developmental theory for developmental education. *Journal of Developmental Education, 24*(1), 2-10, 29.
The writers propose a developmental theory to help categorize what developmental educators have been doing for years to assist in student improvement. The theory rests on developmental psychology research that examines developmental outcomes and that encompasses research on schools as caring communities and on students' adjustment to college. In order to explain how developmental students came to be as they are and the things that they may need to succeed, concepts of self-regulation, demandingness, and responsiveness are used. These concepts can also be useful in predicting the results of employing certain institutional structures, educational practices, and teacher behaviors. The writers discuss the efficacy of techniques like Supplemental Instruction, cooperative learning, and the personalized system of instruction.

Warner, J. M. (2008). *Supplemental instruction for non-science majors biology students: Meanings and influences on science identities for women.* (Ph.D. dissertation), University of North Carolina at Greensboro, Greensboro, NC.
The purpose of this study was to examine the meanings women make of their participation in a Supplemental Instruction (SI) program associated with a postsecondary non-majors biology course. Interview and survey data were utilized to determine why women attended SI, the affordances provided by regular SI participation, how women depicted the learning environment of SI, and how women described science as they experienced it in SI. Additional interviews were conducted with a sub-population of participants who regularly utilized SI to provide an understanding of the role SI participation played in terms of access to science identities for women who changed their majors, minors, or concentration within an education major to biology as a result of their experiences in non-majors biology and SI. The results of this study suggest that the SI experience provides more than just a means to increase grades for women who participate regularly. The supportive and safe climate of the SI environment set a comfort level for women that increased their competence and confidence in biology. The SI experience increased interest in biology and afforded the opportunity for women to be recognized by others, and to recognize themselves, for their science abilities. Additionally, for a small number of women, their experiences in non-majors biology and SI facilitated a shift in science identities that led the women to immigrate into science

Warren, B. Z. (1997, October 10-11, 1997). *Personality, learning style, gender, and ethnic characteristics of students attending Supplemental Instruction.* Conference Proceedings of the Annual Teaching/Learning Conference, Ashland, KY. Retrieved from ERIC database. (ED413019)
A study was conducted to gather information on students participating in Supplemental Instruction (SI) at the University of Central Florida in Spring 1997. Using Long's Personality Checklist, 163 students classified themselves as aggressive-dependent, aggressive-dependent, passive-independent, or passive-dependent. Kolb's Learning Style Inventory was administered to the group. Findings included: (1) Although the

majority of SI students were White and female with aggressive-dependent personality styles, science students displayed assimilator and converger learning styles, while non-science students displayed accommodator learning styles. (2) Hispanics most commonly identified their learning style as assimilator. (3) Black and Hispanic students showed the least inclination toward the converger learning style, while it was one of the main styles displayed by White students.

Warren, B. Z. (1999). *Assessing the impact of college teacher's learning style on student outcomes: A pilot study at the University of Central Florida*. Unpublished manuscript. Retrieved from ERIC database. (ED434083)
This paper investigates the effects of faculty learning style on students grades in five different class sections at the University of Central Florida: Chemistry I, Chemistry for Non-Majors, General Biology, and Law and the Legal System. Kolb's Learning Style Inventory was used. The research recognized that other variables impacted upon this study including participating in Supplemental Instruction.

Warren, B. Z., & Tonsetic, R. (1997). Supporting large classes with Supplemental Instruction (SI). *Journal of Staff, Program, and Organization Development, 15*(2), 47-54.
This paper discusses the use of Supplemental Instruction (SI) at the University of Central Florida (27,000 students) as one component in dealing with helping faculty and students deal with large classes. In Spring 1997 39 classes had an enrollment of 200 or more students. During Fall 1996 SI was provided for four large class sections including a chemistry course for non-science majors. SI participants earned a higher mean final course grade (3.39 vs. 1.72). When adjusted for differences in SAT scores, the SI group still received higher grades (2.54 vs. 1.71). The percent of A and B final course grades was higher for the SI group (47% vs. 20%) as well as lower rates of D, F or course withdrawals (18% vs. 56%). Positive results were also reported for the SI in general biology and American national government. There were no significant differences in the calculus course. While there was high satisfaction with the SI participants, the grade differences were not significant. The authors suggest that the SI sessions in math need modification for more effective use.

Watson, J. (2000). *A Peer Assistance Support Scheme (PASS) for first year core subjects.* Conference Proceedings of the 4th Pacific Rim First Year in Higher Education Conference: Creating Futures for a New millenium, July 5-7, 2000. QUT: Brisbane. Retrieved from http://www.fyhe.com.au/past_papers/abstracts/WatsonAbstract.htm
This paper examines a peer assisted study program that has been offered to three core first year subjects in the School of Economics at the University of New South Wales in Australia. While the paper refers to the program as PASS, it is adapted from Supplemental Instruction (SI) originally developed in the United States. Several variations of the SI model include: not requiring the SI leaders to attend class along with the rest of the students and employing faculty members or academic staff members to supervise the program rather than staff from the campus learning center. Common classes supported through PASS were microeconomics and accounting. The PASS program was evaluated through both student questionnaires as well as evaluating their final course grades. The questionnaire data suggested that PASS contributed to higher

satisfaction and deeper learning of the course content material. Evaluation of the final grades suggested a statistically significant relationship between attending six or more PASS sessions and higher grades. PASS leaders reported benefits of the program as well with development of personal communication skills as well as deeper understanding of the course material.

Watters, J. J., & Ginns, I. S. (1997). *Peer assisted learning: Impact on self-efficacy and achievement*. pages. Paper presented at the American Educational Research Association Conference, March 24-28, 1997, Chicago, IL.
This paper describes the use of program modeled after Supplemental Instruction (SI) in a teacher education course at Queensland University of Technology (Brisbane, Australia). The institutional name for the program is Peer Assisted Study Sessions (PASS). The class had 124 students enrolled in a course designed for first-year Bachelor of Education students. Program outcomes were that SI participants earned higher final course grades (4.88 vs. 4.15 on a scale of 0 to 7) and self-reported development regarding confidence and improved attitudes to learning and science. There was a trend for higher grade achievement with higher levels of attendance at the SI sessions. The SI leaders reported improved confidence, facilitatory skills, and insight into adult education.

Webster, T., & Dee, K. C. (1997, 1997). *Supplemental Instruction benefits students in an introductory engineering course.* Conference Proceedings of the Proceedings of the Conference on Frontiers in Education, Pittsburgh, PA.
This paper describes the use of Supplemental Instruction (SI) during Fall 1996 in Introduction to Engineering Analysis at Rensselaer Polytechnic Institute (Troy, NY). The course is generally taken in the first semester of the freshman year and covers vector mechanics (statics), linear algebra, and computer-based matrix methods for solving engineering problems. Of the students in the class, 23 percent participated in SI sessions. Students who participated in SI earned higher mean final course grades (3.13 vs. 2.67, $p < .025$), higher rate of A & B final course grades (77% vs. 62%, $p < .01$) and received a lower rate of D, F or withdrawals (0% vs. 18%, $p < .01$). There was a positive correlation between higher levels of SI attendance and higher final course grades. All students who attended at least four SI sessions throughout the semester received a final course grade of A or B. A subpopulation of students who were designated as "at-risk" or "high risk" were studied. SI participants earned higher grades their counterparts who did not attend SI sessions (At-risk: 2.60 vs. 2.18; High-risk: 2.38 vs. 1.58; $p < .01$). The researchers reported that unfortunately half of these students did not participate in any SI sessions. Surveys of students suggested the following improvements for the SI program: hold more sessions during the academic term to help reduce SI session size (mean size = 13); hold SI sessions longer than one hour to provide sufficient time to deal with material; and consider more than one SI leader to allow smaller SI session size. SI leaders provided feedback to the course instructor concerning the comprehension level of students concerning the course material. Instructors used the feedback to modify future course lectures. SI leaders the following benefits of the SI program for themselves: deeper understanding of course material, excelled in other courses since they were reviewing basic concepts in the SI course,

developed communication skills, improved teaching skills, and enhanced leadership skills.

Webster, T., & Dee, K. C. (1998). Supplemental Instruction integrated into an introductory engineering course. *Journal of Engineering Education, 87*(4), 377-383. This article describes the use of Supplemental Instruction (SI) during Fall 1996 in Introduction to Engineering Analysis at Rensselaer Polytechnic Institute (Troy, NY). The course is generally taken in the first semester of the freshman year and covers vector mechanics (statics), linear algebra, and computer-based matrix methods for solving engineering problems. Of the students in the class, 23 percent participated in SI sessions. Students who participated in SI earned higher mean final course grades (3.13 vs. 2.67, p < .025), higher rate of A & B final course grades (77% vs. 62%, p < .01) and received a lower rate of D, F or withdrawals (0% vs. 18%, p < .01). There was a positive correlation between higher levels of SI attendance and higher final course grades. All students who attended at least four SI sessions throughout the semester received a final course grade of A or B. A subpopulation of students who were designated as "at-risk" or "high risk" were studied. SI participants earned higher grades their counterparts who did not attend SI sessions (At-risk: 2.60 vs. 2.18; High-risk: 2.38 vs. 1.58; p < .01). The researchers reported that unfortunately half of these students did not participate in any SI sessions. Surveys of students suggested the following improvements for the SI program: hold more sessions during the academic term to help reduce SI session size (mean size = 13); hold SI sessions longer than one hour to provide sufficient time to deal with material; and consider more than one SI leader to allow smaller SI session size. SI leaders provided feedback to the course instructor concerning the comprehension level of students concerning the course material. Instructors used the feedback to modify future course lectures. SI leaders the following benefits of the SI program for themselves: deeper understanding of course material, excelled in other courses since they were reviewing basic concepts in the SI course, developed communication skills, improved teaching skills, and enhanced leadership skills.

Webster, T., & Hooper, L. (1998). Supplemental Instruction for introductory chemistry courses: A preliminary investigation. *Journal of Chemical Education, 75*(3), 328-331. Available: Thomas Webster, The Advising and Learning Assistance Center, Rensselaer Polytechnic Institute, Troy, NY 12180.
This article describes the use of Supplemental Instruction (SI) between Spring 1995 and Fall 1995 at the University of Pittsburgh (PA) for two semesters in General Chemistry I and for one semester in Organic Chemistry I. After a review of the literature concerning academic needs in science, the researchers describe the results of their study. The percentage of students that participated in SI ranged from 37 to 45 percent. Students uniformly rated the SI sessions very helpful (0 to 5 point scale: ranged from 4.1 to 4.5). The results uniformly favored the SI participants: Gen Chemistry S95: A & B grades, 39% vs. 30%; D, F & W, 10% vs. 34%; mean final grade, 2.34 vs. 1.95. General Chemistry F95: A & B grades, 43% vs. 33%; D, F & W, 15% vs. 31%; mean final grade, 2.46 vs. 2.19. Organic Chemistry F95: A & B grades, 54% vs. 33%; D, F & W, 6% vs. 26%; mean final grade, 2.59 vs. 2.17. The researchers suggested that SI has helpful in

chemistry since it helped in the following areas: mathematics, problem solving, conceptualization, theoretical, and familiarization with the chemical language.

Webster, T., & Malloch, C. (1997). *Supplemental Instruction benefits students in a traditional and non-traditional introductory physics course: A two semester study*. Unpublished manuscript. Rensselaer Polytechnic Institute. Available: Thomas Webster, The Advising and Learning Assistance Center, Rensselaer Polytechnic Institute, Troy, NY 12180
After a review of the literature concerning physics education, this paper describes the use of Supplemental Instruction (SI) at Rensselaer Polytechnic Institute (Troy, NY). An introductory physics course (Physics 2) was studied during Fall 1996 and Spring 1997. The fall course was taught in the traditional method. The spring section of the course used the CUPLE Studio Physics Project and was much smaller the fall course. Students who received a D or F on the second exam were classified as "high-risk" and students who received a C on the same exam were designated as "at-risk." Students who attended SI received significantly ($p < .01$) higher mean final course grade (3.37 and 3.08 for the traditional and non-traditional learning environments, respectively) than those students who did not attend SI (3.09 and 2.44, respectively). Students who attended SI received a significantly ($p < .01$) lower rate of D and F final grades (1% and 5%, respectively) than the students who did not attend (8% and 37%, respectively). The data suggests that students who began to attend SI early and frequently (at least 6 times throughout the semester) benefitted more than SI than students who attended SI late in the semester or infrequently. Students who were classified as at-risk or high-risk and attended SI earned higher grades than their counterparts who did not attend SI sessions.

Weil, D. (1996, 1996, April 23). New program focuses on high-risk courses, *The Alestle Newspaper,* pp. 1, 4.
This newspaper article describes the use of Supplemental Instruction (SI) program at Southern Illinois University at Edwardsville in the biology department. Dr. Gertraude Wittig, coordinator of the SI program in the biology department, said that SI is different from traditional tutoring since students are actively involved in the sessions and focus is placed on development of both learning skills and content mastery.

Weiner, R. (1995, 1995, November 30). College officials tout new program. Students having trouble in class can get extra instruction, *St. Louis Post Dispatch Newspaper,* p. 2.
This newspaper article describes the use of Supplemental Instruction (SI) at two area community colleges in the St. Louis, MO area (St. Louis Community College-Meramec and St. Louis Community College-Florissant Valley). Meramec's president, Richard Black, said that the SI program was tied to the State of Missouri's Funding for Results program that rewards colleges for achieving results.

Weiner, R. (1995, 1995, December 4). Community college students get help from 'old pros' people who have already passed classes give newcomers a boost, *St. Louis Post Dispatch Newspaper,* p. 1.

This newspaper article describes the use of Supplemental Instruction (SI) at two area community colleges in the St. Louis, MO area (St. Louis Community College-Meramec and St. Louis Community College-Florissant Valley). Meramec's president, Richard Black, said that the SI program was part of a program to ensure accountability in education to improve its effectiveness in serving students.

Weiner, R. (1995, 1995, December 7). Community colleges' program helps students help each other, *St. Louis Post-Dispatch Newspaper,* p. 3.
This newspaper articles describes the use of Supplemental Instruction (SI) at two community colleges in the St. Louis, MO area (St. Louis Community College-Meramec and St. Louis Community College-Florissant Valley). Gwen Nixon, who administers academic support programs at Florissant Valley said that success rates rose by ten percent in Spring 1995 in courses where SI was offered. SI is offered in the following courses at Florissant Valley: American history, economics, accounting, college algebra, chemistry, and biology. Willis Loy, Associate Dean for Mathematics and Communications at Meramec stated that the SI program is cost effective since it only takes the retention of one student who would have withdrawn from a course to pay for the salary of the SI leader.

Westin, L. K., & Nordström, M. (2002). *Supplemental Instruction (SI) - Applied on the course Object-Oriented Programming Methodology*. Unpublished manuscript. Department of Computing Science, Umeå University. Lund, Sweden.
Supplemental Instruction (SI) was started in the introductory computer programming course at Umea University (Sweden) due to the low pass rate of the students in recent years. The SI program was started in Fall 2002 and the report describes the SI program results. After the introductory section of the report devoted to an overview of SI and identifying the need for academic assistance with the Swedish students, the report provides a detailed narrative for how SI was implemented with recommendations for program modifications. The final section of the report is devoted to an analysis of the impact of SI with students regarding test scores and course withdrawal. If students attended three of more times during the academic term, academic results were favorable for the SI participants.

Whatman, S. (1995). *Peer assisted study sessions with Aboriginal and Tores Strait Islander students during semester two, 1995*. Unpublished manuscript. Queensland University of Technology. Brisbane, Queensland, Australia.
This report describes the use in semester 2, 1995 of Peer Assisted Study Sessions (PASS) at Queensland University of Technology (Australia) with first year Aboriginal and Torres Strait Islander (A&TSI) students who were attending class at the Gardens Point Campus. PASS is the locally used name for Supplemental Instruction (SI). A&TSI students had typically experienced considerable difficulty in courses such as Information Technology and Business. These courses historically had low Indigenous student enrollments, and consequently, had very few successful graduates. Eight courses were selected for PASS support: Computer Applications, Software Development 1 & 2, Technology of Information Systems, Business Communication & Application Development, Theoretical Perspectives on Communication,

Microeconomics, and Reporting Principles. Before introduction of the PASS program in the second semester, the A&TSI students as a group earned fairly low grades. At the end of the semester with PASS support, the students earned higher final course grades. PASS leaders reported the following benefits for themselves: more opportunity to talk with faculty members, greater understanding of course content which helped in other classes, and developed friendships with more students that they would normally would have not met.

White, B. (1996). The student peer mentor program in its trial year: A mentor's perspective. *Queensland University of Technology Law Journal, 12*(1), 221-228.
In 1994 the Student Peer Mentor program was piloted in the Bachelor of Laws program of study (two individual classes: Torts and Law of Contract) at Queensland University of Technology in Australia. The program was based upon Supplemental Instruction (SI). This article describes the program from the perspective of one of the student mentors. Strengths of the program included: less private time needed to study; non-threatening environment; identified academic skills needed for success; and expanded social circles. Benefits of the program for the mentors included: improved interpersonal communication skills; increased content comprehension; provided personal satisfaction of helping others; and improved confidence in leadership and group situations.

Wiatr, J., & Stout, B. (1999). *Get creative: Working with SI data.* Conference Proceedings of the First National Conference on Supplemental Instruction and Video-based Supplemental Instruction, Kansas City, MO.
This article examined possibilities of developing graphic visuals that help relate necessary information to a variety of audiences interested in the SI model. Starting with data routinely collected in the term end report, the authors moved to considering other resources needed to answer a diverse range of questions about the value of SI in the post secondary setting.

Widhaim, S. (2004, 2004, April 12). Meeting of minds: Studying in groups pays off in learning, *The Washington Times Newspaper,* p. B1.
This newspaper article describes the Supplemental Instruction (SI) program at George Mason University. The article contains numerous quotations by SI leaders as well as SI participants.

Widmar, G. E. (1994). Supplemental Instruction: From small beginnings to a national program. In D. C. Martin & D. Arendale (Eds.), *Supplemental Instruction: Increasing achievement and retention* (pp. 3-10). New Directions for Teaching and Learning No. 60. San Francisco: Jossey Bass
The chief student affairs officer at the University of Missouri-Kansas City offers a historical review of the development and implementation of Supplemental Instruction (SI). The SI program was first implemented with the Dental, Medical, and Pharmacy schools since an unacceptable rate of students were leaving the institution. Later the SI program was expanded to the College of Arts and Sciences. The author describes the administrative and political issues that must be addressed to meet issues important to administrators and faculty members. Since the Division of Student Affairs views its

programs as cocurricular rather than extracurricular, administrative placement of the SI program with Student Affairs was a natural fit for the campus. Faculty and administrative support for SI remains for the following reasons: SI supports cultural diversity; SI supports critical thinking; SI supports student retention and academic performance; and SI is both replicable and adaptable.

Widmar, G. E., & DeBuhr, L. (1987). Supplemental Instruction: Meeting the academic development needs of students at urban universities. In A. Artibise & W. Fraser (Eds.), *New Directions for Urban Universities: International Perspectives*. Winnipeg, Canada: Institute of Urban Studies
This book chapter discusses the use of Supplemental Instruction (SI) as a strategy to support the academic success of students.

Wiethop, C. (1985). Supplemental Instruction planned. *Current (University of Missouri-St. Louis Student Newspaper)*, 1-3.
This newspaper article describes the implementation of the Supplemental Instruction (SI) program on the campus of the University of Missouri-St. Louis.

Wilcox, F. K. (1992). Reasons educators and students choose Supplemental Instruction. In D. C. Martin & D. R. Arendale (Eds.), *Supplemental Instruction: Improving first-year student success in high-risk courses* (2nd ed., pp. 27-30). Columbia, SC: National Resource Center for The Freshman Year Experience and Students in Transition.(ERIC Document Reproduction Service No. ED354839). Retrieved from https://netfiles.umn.edu/users/arend011/www/peer/SIFYEmonograph.pdf.
In this chapter a variety of factors are identified that have been reported as significant in generating interest by educators and students with Supplemental Instruction. These factors include: SI supports high academic standards; cost-effectiveness of the SI program; meets immediate pragmatic needs of students; SI avoids a remedial/developmental image; SI sessions are non-threatening for students; SI sessions develop a community of supportive learners; and SI helps students to develop transferable study strategies..

Wilcox, F. K. (1992). Twenty years of Supplemental Instruction: An interview with Deanna Martin. *Supplemental Instruction Update*, 1, 6.
This newsletter interview of Deanna Martin, creator of the Supplemental Instruction (SI) program, discusses the historical development of the model and its part in the development of collaborative learning in higher education. Martin believes that the next stage of development for SI is its mainstreaming of academic support and integration of learning strategies into the classroom. She reports of how SI is being used for faculty development.

Wilcox, F. K. (Writer). (1993). Supplemental Instruction: Improving academic success in historically-difficult courses [Audio cassette], *1993 National Conference on Higher Education, New Orleans, LA*. Iowa City, IA: National Center for Student Retention

Taped at the 1993 National Conference on Higher Education in New Orleans, LA, Dr. Kim Wilcox from UMKC discusses his experience with Supplemental Instruction (SI), a nonremedial model of student academic assistance that targets historically-difficult courses rather than high-risk students.

Wilcox, F. K. (1995). Supplemental Instruction and efficiency in learning. In M. T. Keeton, B. Mayo-Wells, J. Porosky & B. Sheckley (Eds.), *Efficiency in adult higher education: A practitioner' handbook* (pp. 102-107). College Park, MD: The University of Maryland University College, Institute for Research on Adults in Higher Education
This chapter provides an overview of the Supplemental Instruction (SI) program. The SI program is efficient since it provides a highly effective academic support program (higher grades, lower course withdrawals, higher reenrollment and graduation rates) for a moderate cost by employing student facilitators. Since the SI sessions occur outside of class, it preserves the time available for the course professor and allows them to more efficiently use their class time addressing the course material rather than using a portion of the time to address issues best addressed during the SI sessions.

Wilcox, F. K. (1996). Supplemental Instruction in South Africa: An interview with Andre Havenga. *Supplemental Instruction Update*, 1, 3.
This interview describes the development of the Supplemental Instruction (SI) program at institutions in the Republic of South Africa. Andre Havenga is an SI Certified Trainer for South Africa and is also the Director of Instructional and Organizational Development at the University of Port Elizabeth (UPE). UPE provides SI support for 77 courses in 21 academic departments. Havenga reports the following benefits of the SI program: provides academic support for the new student subpopulations that were formerly excluded by government policy; academic support is mainstreamed with academic courses; provides faculty development through feedback that allows the instructor to clarify and provide additional information at the next class session; and provide another forum for social integration. SI leaders report a number of benefits for themselves: enhanced academic skills; improved self-confidence; additional work experience that may help with job interviews; and additional contact with key faculty members from their discipline.

Wilcox, F. K. (1996). Supplemental Instruction in Sweden: An interview with Marita Bruzell-Nilsson and Leif Bryngfors. *Supplemental Instruction Update*, 1, 3.
This interview describes the development of the Supplemental Instruction (SI) program in Sweden. Academic assistance at postsecondary institutions in Sweden is a new movement. The interviewees are SI Supervisors at Lund University (Lund, Sweden) and are also Certified Trainers for SI. Nearly a dozen institutions in Sweden have established SI programs. SI leaders report that they like serving in the program since they have an opportunity to: develop their presentation skills; practice putting forth a point of view; and developing group management skills that will be useful when they become employed.

Wilcox, F. K. (Writer). (1996). Supplemental Instruction session demonstration [Videotape]. In F. K. Wilcox (Producer). Kansas City, MO: Center for Supplemental Instruction, The University of Missouri-Kansas City
This videotape provides a simulation of a Supplemental Instruction (SI) session in an introductory Physical Science course. Students who are participating in SI during the current academic term simulate a SI session for a recent class lecture. Common SI session activities are illustrated: vocabulary development, identification of main ideas, connecting ideas, creating visual matrixes, lecture note review, and test question prediction. SI participants and the SI leader for the course share benefits of SI participation. The moderator then provides a debrief of the SI session.

Wilcox, F. K. (1996). Supplemental Instruction: Academic support in high-risk courses. *Midwest Regional Association for Developmental Education Newsletter*, 10-11.
This newsletter article provides an overview of the Supplemental Instruction (SI) program.

Wilcox, F. K. (1997). Supplemental Instruction in Australia: An interview with Ron Gardiner. *Supplemental Instruction Update*, 1-2.
This interview with Ron Gardiner provides an overview of the development of Supplemental Instruction (SI) at institutions in Australia. Gardiner, a physicist, is an SI Certified Trainer and is Emeritus Professor and Coordinator of the SI program at Queensland University of Technology in Brisbane. An additional feature of the SI program is that the classroom instructor requests feedback from the SI leader concerning the comprehension level of the students. This provides an opportunity for the instructor to clarify or provide more information at the next class period.

Wilcox, F. K. (1998). Supplemental Instruction. *NASPA IV West Newsletter*, 4.
This short newsletter article provides a basic overview of the Supplemental Instruction (SI) program. The article three of the reasons that are commonly cited by institutions regarding why they have selected SI: (1) high risk courses are easy to identify; (2) SI meets the perceived needs of students; and (3) SI avoids a remedial image and is non-threatening.

Wilcox, F. K. (1999). Killer course survival: Supplemental Instruction. *The College Parent Advisor, 3*(1), 2-3.
This article provides a general overview of the Supplemental Instruction (SI) model.

Wilcox, F. K. (Writer). (1999). Supplemental Instruction: Empowering student learning [Videotape]. In K. Patterson & K. Wilcox (Producer). Kansas City, MO: Center for Supplemental Instruction, The University of Missouri-Kansas City
This videotape provides an overview of Supplemental Instruction (SI) through short interviews with SI leaders, SI participants, campus administrators, and Deanna Martin, creator of the SI model.

Wilcox, F. K. (2008). Implementing a new Supplemental Instruction program. In M. E. Stone & G. Jacobs (Eds.), *Supplemental Instruction: Improving first-year student*

success in high-risk courses (Monograph No. 7, 3rd ed., pp. 29-38). Columbia, SC: University of South Carolina, National Resource Center for the First-Year Experience & Students in Transition
This chapter presents critical elements for implementing a new Supplemental Instruction (SI) program. This elements include: carefully designing a small pilot program before a wide-spread implementation; providing sufficient staff to manage the pilot SI program (trained SI supervisor, trained SI leaders); carefully selecting courses that are historically-difficult; developing positive relationships with the faculty members who teach the classes for the pilot SI program; securing institutional funding for the program staff, materials; locating the SI pilot program in appropriate classroom space; marketing the SI program to administrators, faculty, and students; appropriately assessing and evaluating the SI pilot program; and planning for a thoughtful expansion o f the SI program after a successful pilot experience.

Wilcox, F. K., & Jacobs, G. (2008). Thirty-five years of Supplemental Instruction: Reflections on study groups and student learning. In M. E. Stone & G. Jacobs (Eds.), *Supplemental Instruction: Improving first-year student success in high-risk courses* (Monograph No. 7, 3rd ed., pp. vii-x). Columbia, SC: University of South Carolina, National Resource Center for the First-Year Experience & Students in Transition
This chapter reviews the history of SI as it was created at the University of Missouri-Kansas City in 1973 and has since spread to more than 1,500 colleges and universities in 29 countries. Topics explored in the chapter include providing additional venues of conversation for students in addition to that with the course professor, extending learning outside of the classroom to deepen understanding, and helping students to make sense out of their class notes, memory, and textbook readings.

Wilcox, F. K., & Koehler, C. (1996). Supplemental Instruction: Critical thinking and academic assistance. *Metropolitan Universities: An International Forum, 6*(4), 87-99.
This article provides a basic overview of the Supplemental Instruction (SI) including data from the University of Missouri-Kansas City. A UMKC study reviewed data from a geographically and institutionally diverse group of 146 institutions that used SI in 2,875 courses of diverse academic areas with an enrollment of 298,629 students. The data suggests that SI participants earned higher mean final course grades (2.30 vs. 1.85); higher percent of A and B final course grades (47.5% vs. 35.8%) and a lower rate of D, F and course withdrawals (23.7% vs. 38.0-%). A 1989 study at UMKC found that SI participants reenrolled the following semester at a higher rate than non-SI participants (90.0% vs. 81.5%). A study of SI and non-SI participants during their first academic term at UMKC in Fall 1983 found that by Fall 1989 the SI participants had graduated at a higher rate (30.6% vs. 18.2%). A comparison is made between the traditional paradigm of learning that is the current pedagogy of most classroom instructors and the new reflective learning paradigm. SI sessions help students to use both paradigms to maximize learning and academic achievement.

Wilcox, F. K. E. (n.d.). *Supplemental Instruction Update*.
The Supplemental Instruction Update newsletter is published by the National Center for Supplemental Instruction (SI) at the University of Missouri-Kansas City. Topics in the

newsletter include: interviews with SI programs in programs around the world; articles discussing adaptions of the SI model; reports of SI research studies; information regarding upcoming training workshops for SI Supervisors and conferences for SI program managers; and other topics. Subscriptions are complimentary for anyone regardless of whether they have currently active SI programs.

Wilkerson, S. L. (2008). *An empirical analysis of factors that influence the first year to second year retention of students at one large, Hispanic Serving Institution (HSI).* (Ph.D. dissertation), Texas A&M University, College Station, TX.
The purpose of this study was to identify how input and environmental factors impact first-to-second year retention of undergraduate students at a large Hispanic Serving Institution (HSI). An additional purpose of the study was to determine the usefulness of the Astin Typology as a predictive factor for student retention. The sample for the study was 1,296 first-year students enrolled at the University of Texas at San Antonio during the 2002, 2003, and 2004 academic years. Data used for the study included student responses to the Cooperative Institutional Research Program (CIRP): Freshman Survey (to identify each participant's Astin type), gender, ethnicity, SAT scores, rank in high school class, first-generation status, financial need, first-semester residence, entry-college, semester credit hours attempted, academic course difficulty, participation in Supplemental Instruction, and enrollment in a first-year seminar course. Both descriptive and univariate statistics were used to describe the sample population, as well as the similarities and differences found to exist among the seven Astin types. Three separate logistic regression analyses organized by Astin's I-E-O framework were conducted to develop a predictive model for retention from the first-to-second year of college. Subsequent analyses were conducted to identify the specific factors that were useful for predicting retention for each of the seven Astin types. The major findings of this study were: (1) The most frequent Astin type identified within the sample population was Status Striver ; (2) The model that included both Input and Environmental factors was the most accurate model for predicting retention; (3) Students who were classified as Hedonist, Status Striver , and Uncommitted were less likely to be retained at this institution when all other input and environmental factors were controlled. (4) Environmental factors were most useful for predicting retention, in particular, semester credit hours attempted that had an inverse relationship with retention for all Astin types; (5) First-generation status, financial need, SAT score were not useful for the prediction of retention; (6) First-year seminar course enrollment and participation in Supplemental Instruction had a positive impact on retention.

Williams, O., Jeffries, M., & Fortier, P. (1990). Minority student retention: A successful partnership. *The 1990 National Conference on Student Retention, Washington, D.C.* [Audio cassette]. Madison, WI: Topitzes & Associates
Taped at the 1990 National Conference on Student Retention in Washington, D.C., three experts provide a general administrative overview of minority student retention programs at the University of Illinois (Urbana); discuss the linkages of minority students to academic support services such as tutoring, study skills, and Supplemental Instruction; and explain the academic monitoring process of counseling students.

Finally the three discuss the success rate that the combined program has promoted. A question and answer period follows.

Willox, A. C. (2007). Reclaiming impersonal academic space through Supplemental Instruction: Reflections on the transformation of the learner and the learning environment at the undergraduate level. *Journal of Student Centered Learning, 3*(3), 151-156.
Supplemental Instruction (SI) was used at the University of Guelph in Canada to improve student academic performance. The author describes the learning space that is created for student dialogue and personal reflection.

Wilson, M. (2005). Supplemental Instruction in the Canadian context. *The Journal of Student Centered Learning, 2*(2), 109-119.
The University of Guelph in Ontario, Canada has modified the Supplemental Instruction (SI) program and as a result renamed it Supported Learning Groups (SLG)s. In addition to traditional elements of SI programs, the SLG approach has fostered curriculum and faculty development as a result of feedback provided by the peer leaders. Students also receive mentoring from the SLG leaders as well. The program has continued to expand based on successful results.

Wittig, G., North, S., & Thomerson, J. E. (1996). Supplemental Instruction improves student retention and performance in biology. *Transactions, 89*(65), 79.
This article reports the use of Supplemental Instruction (SI) in a biology course at Southern Illinois University at Edwardsville. Success in Biology 120, which introduces into the majors core, is a strong predictor of academic survival. Because 50 percent of students earned D, E and withdrawal grades, SI was introduced. Undergraduate SI leaders were placed in both lectures and laboratories, and they offered weekly, out-of-class SI sessions. Of 171 Fall 1995 and 88 Spring 1996 students, 56 and 67 percent respectively participated in SI. Students attending from 4 up to 37 sessions per semester averaged a full grade point better course grades than non-SI students and hardly any (4 and 0 respectively) D, E, and withdrawal grades. Differences were significant at the 1 and 5 percent level respectively.

Wolfe, R. F. (1987). The Supplemental Instruction program: Developing learning and thinking skills. *Journal of Reading, 31*(3), 228-232.
The author describes implementation of the Supplemental Instruction at Anne Arundel Community College in Arnold, Maryland. A Fall 1986 research study concerning the impact of the SI program with a History 211 course suggested that SI participation contributed to higher final course grades (2.5 vs. 1.6) and lower rates of D, F and withdrawal (16% vs. 55%) even though the SI participants had a lower mean SAT score. SI participants self-reported high satisfaction with their experience in the SI program (4.5 on a 5 point scale). Some professors at the college reported using the SI program for faculty development in the following ways: sometimes the course instructor incorporated SI leader developed materials initially used during SI sessions; used the SI leader as a feedback forum for evaluating the comprehension level of students of key concepts.

Wolfe, R. F. (1987). The Supplemental Instruction program: Developing learning and thinking skills across the curriculum. *Issues in College Learning Centers, 5*, 5-12.
The author describes implementation of the Supplemental Instruction (SI) at Anne Arundel Community College in Arnold, Maryland. A Fall 1986 research study concerning the impact of the SI program with a History 211 course suggested that SI participation contributed to higher final course grades (2.5 vs. 1.6) and lower rates of D, F and withdrawal (16% vs. 55%) even though the SI participants had a lower mean SAT score (370 vs. 430). Another indication of the influence of the SI program was a shift of the overall rate of D, F and course withdrawals from 45 percent down to 33 percent for the History 211 course. Some professors at the college reported using the SI program for faculty development in the following ways: sometimes the course instructor incorporated SI leader developed materials initially used during SI sessions; used the SI leader as a feedback forum for evaluating the comprehension level of students of key concepts.

Wolfe, R. F. (1987). Writing across the curriculum through Supplemental Instruction. *Maryland English Journal, 21*(2), 43-48.
At Anne Arundel Community College (Arnold, MD), the Supplemental Instruction (SI) program is also used to improve students' writing skills. In SI sessions for a history class during Fall 1986 additional activities were directed to developing writing skills. Research suggests that SI participants demonstrated improved performance in written essay examinations. The activity had four steps: 1) overview all material from notes and text that could be used to answer the question; 2) organize the information; 3) develop a summary statement; and 4) develop an outline for the answer. SI participants earned a higher mean final course grade (2.5 vs. 1.6) and a lower rate of D, F and course withdrawals (16% vs. 55%).

Wolfe, R. F. (1988). A model retention program for the community college. *Maryland Association for Higher Education Journal, 11*, 18-20.
This article describes the implementation of the Supplemental Instruction (SI) program at Anne Arundel Community College (Arnold, MD). In addition to a descriptive overview of the SI program, data from a 1987 research study suggests that SI participants received higher mean final course grades (2.6 vs. 1.9) and lower rates of D, F and withdrawals (24% vs. 44%). Using the same data set, when developmental education students and students of color were studied regarding the impact of SI attendance, the results were more pronounced than when examining the entire class of students. SI participants earned higher mean final course grades (3.1 vs. 1.8).

Wolfe, R. F. (1988). *Supplemental Instruction with mentoring support at Anne Arundel Community College.* Conference Proceedings of the Midwest College Learning Center Association Conference., Chicago, IL. (ERIC Document Reproduction Service No. ED413942).
The Supplemental Instruction (SI) program at Anne Arundel Community College (Arnold, MD) was modified to use faculty members as SI supervisors. While this was the initial focus for the faculty members, the mentor role evolved into an opportunity for

them to observe colleagues and to grow as teachers. Faculty mentors were placed in classes outside their own discipline. The classroom instructor and faculty mentor would meet periodically to provide feedback to each other and discuss strategies to improve instructional effectiveness.

Wolfe, R. F. (1990). Professional development through peer interaction. *The Journal of Professional Studies, 14*(1), 50-57.
The Supplemental Instruction (SI) program at Anne Arundel Community College (Arnold, MD) was modified to use faculty members as SI supervisors. While this was the initial focus for the faculty members, the mentor role evolved into an opportunity for them to observe colleagues and to grow as teachers. Mentors are placed in classes outside their own discipline. Faculty mentors were placed in classes outside their own discipline. The classroom instructor and faculty mentor would meet periodically to provide feedback to each other and discuss strategies to improve instructional effectiveness. Faculty mentor roles included: 1) attending a three-day pre-semester training seminar (e.g., examined learning strategies, examined their own teaching and learning styles, learned questioning techniques, and practiced group management); 2) attending all classes and study sessions as a student in the target class for the first four weeks of the semester; 3) working with student leaders to prepare strategies for the study session; 4) working with student leaders to create supplemental materials such as graphic representation of abstract concepts; 5) formally evaluating student leaders during the second half of the semester, and 6) keeping a daily journal to record their observations and reflections about classes and SI sessions.

Wolfe, R. F. (1991). *Supplemental Instruction with mentoring support at Anne Arundel Community College*. Anne Arundel Community College. Arnold, MD. Retrieved from ERIC database. (ED413942)
Anne Arundel Community College's Supplemental Instruction (SI) with Mentoring Support provides a program of academic support for students enrolled in difficult required courses, while also creating valuable opportunities for faculty professional development and community interaction. By adapting the SI model for the community college, this program has trained students and faculty to work together to facilitate learning and thinking skills through a learner-centered approach of peer group study and community and faculty mentoring support. Student SI leaders are trained through a three-credit hour practicum in education course. Faculty who are trained in study skills and learning strategies through a three day pre-term training seminar: attend classes and study sessions in courses outside their discipline for the first four weeks of the academic term; work as mentors to student SI leaders to prepare strategies for SI sessions; work with SI leaders to create supplemental materials; formally evaluate SI leaders during the second half of the academic term; and maintain a daily journal. In evaluating the project, faculty mentors stated the program provided an opportunity to broaden their professional expertise and their perspectives on student learning. They had developed new teaching approaches, an awareness of their teaching styles, and an understanding of students' needs. A second modification to the SI program provided local community leaders in their career fields to provide mentoring support in small group sessions and on-site visits. On the day of the community leader's visit, SI leaders

conduct an abbreviated SI session, giving the community mentor the opportunity to observe and participate in an SI session. Then, the community mentor speaks informally with students, discussing career related topics and answering students' questions.

Wolfe, R. F., & Wells, E. (1990). Community mentors for Supplemental Instruction. *National Association for Developmental Education Newsletter*, 12.
Anne Arundel Community College (Arnold, MD) has made an adaption of the Supplemental Instruction (SI) to provide additional information concerning personal and career options related to the courses that have SI attached to them. A community person (mentor) is invited to attend one SI session for a course that is applicable to the mentor's field. A mentor may be a personal friend of the course instructor, or may be active in the vocational trade council, cooperative education, or advisory boards serving career programs at the college. The SI leader helps prepare the SI participants to generate questions for the mentor's visit. The mentors become another partner in encouraging academic success and the meaningfulness of the course for future jobs. Upon mutual interest, the mentors and students may continue discussions outside of class and SI sessions that might result in job site visits or additional career discussions.

Wong, J. G., Waldrep, T. D., & Smith, T. G. (2007). Formal peer-teaching in medical school improves academic performance: The MUSC Supplemental Instructor program. *Teaching and Learning in Medicine, 19*(3), 216-220.
The Medical University of South Carolina's Center for Academic Excellence created a Supplemental Instruction (SI) program which employed upper-level medical students to teach junior peers in basic science topics using SI activities and protocols. A control group of similar students were assigned to small study groups that followed more traditional recitation procedures. Both groups of students had similar academic profiles. The SI participants received higher USMLE Step 1 and Step 2 scores and final medical school GPA compared to the non participants.

Wood, T. (1984, 1984, September 10). Plan aims at making students better thinkers, *The Kansas City Star Newspaper,* pp. 1A, 5A.
The newspaper article provides an overview of the Supplemental Instruction (SI) program. The article contains an interview with several SI personnel -- including Deanna Martin, creator of the SI program -- and faculty members who have SI attached to their class. Faculty report support for the program for the following reasons: do not have to spend time in class repeating content material since it can be discussed more fully in SI sessions; improves academic performance of students; and does not infringe upon the tradition of the professor's role in the learning process. In the Foundations of Philosophy course the SI participants received a mean final course grade of 2.3 (out of 4.0) as compared with 1.4 for non-SI participants.

Worthington, A., Hansen, J., Nightingale, J., & Vine, K. (1995). *Peer teaching and introductory economics: An application using the Peer Assisted Study Scheme (PASS) at the University of New England.* Conference Proceedings of the Australian Economics

Education Symposium in conjunction with the 24th Conference of Economists, Adelaide, South Australia, Australia.
This paper discusses the use of Peer Assisted Study Scheme (PASS) with approximately 300 students in an Introductory Microeconomics class at the University of New England (Australia) in 1995. PASS is an Australian contextualization of the Supplemental Instruction (SI) program. After an overview of peer collaborative learning and challenges with student learning in economics courses, the paper shares the results of qualitative and quantitative research. Quantitative data included assessment scores, the final exam results and the responses to a 34 item survey administered to all students in the class. The survey included questions about their experience in the PASS sessions, reasons they did or did not participate in PASS, usefulness of the tests, possible reasons for academic difficulty in the class, and to predict their final grade in the class. Data were analyzed using Item Response Theory and multiple linear regression techniques. Qualitative data were collected by the PASS coordinator from weekly written reports of the PASS facilitators, PASS session observations, and in-depth interviews. About one-third of the students participated in SI. Of these students, more than 50 percent attended more than half of the available sessions during the academic term. The PASS participants listed either "to improve understanding" or "to gain additional information" as the top reason for attending the sessions. Only five percent listed "to learn study skills" as the top reason. Only 22 percent of the nonparticipants said that they had no desire to attend or thought they were unnecessary. The most common reason not to attend related to insufficient time. It appears that the SI programs is directly beneficial to the SI participants and indirectly beneficial to non-SI participants since the program influenced the teaching staff to increase student learning. Before introduction of PASS, the failure rate in the course was 33 percent. Following the introduction of PASS, the failure rates have dropped to 18 percent. Through weekly feedback from the PASS facilitator, the class lecturer reported that he intentionally modified the lecture content and his lecturing style. One change was that the lecturer reduced the volume of information delivered so that more time could be spent on improving student understanding of critical concepts.

Worthington, A., Hansen, J., Nightingale, J., & Vine, K. (1997). Supplemental Instruction in introductory economics: An evaluation of the University of New England's Peer Assisted Study Scheme (PASS). *Australian Economic Papers*, 69-80.
This articles discusses the use of Peer Assisted Study Scheme (PASS) with approximately 300 students in an Introductory Microeconomics class at the University of New England (Australia) in 1995. PASS is an Australian contextualization of the Supplemental Instruction (SI) program. After an overview of peer collaborative learning and challenges with student learning in economics courses, the paper shares the results of qualitative and quantitative research. Quantitative data included assessment scores, the final exam results and the responses to a 34 item survey administered to all students in the class. The survey included questions about their experience in the PASS sessions, reasons they did or did not participate in PASS, usefulness of the tests, possible reasons for academic difficulty in the class, and to predict their final grade in the class. Data were analyzed using Item Response Theory and multiple linear regression techniques. Qualitative data were collected by the PASS coordinator from

weekly written reports of the PASS facilitators, PASS session observations, and in-depth interviews. About one-third of the students participated in SI. Of these students, more than 50 percent attended more than half of the available sessions during the academic term. The PASS participants listed either "to improve understanding" or "to gain additional information" as the top reason for attending the sessions. Only five percent listed "to learn study skills" as the top reason. Only 22 percent of the nonparticipants said that they had no desire to attend or thought they were unnecessary. The most common reason not to attend related to insufficient time. It appears that the SI programs is directly beneficial to the SI participants and indirectly beneficial to non-SI participants since the program influenced the teaching staff to increase student learning. Before introduction of PASS, the failure rate in the course was 33 percent. Following the introduction of PASS, the failure rates have dropped to 18 percent. Through weekly feedback from the PASS facilitator, the class lecturer reported that he intentionally modified the lecture content and his lecturing style. One change was that the lecturer reduced the volume of information delivered so that more time could be spent on improving student understanding of critical concepts.

Wright, G. L., Wright, R. R., & Lamb, C. E. (2002). Developmental mathematics education and Supplemental Instruction: Pondering the potential. *Journal of Developmental Education, 26*(1), 30-35.
During the Spring, Summer, and Fall 2000 semesters, data were gathered and analyzed concerning the effective use of Supplemental Instruction (SI) in 90 developmental mathematics courses. The study monitored student outcomes in a small pilot program conducted at a southern state university with about 11,000 students. The student outcomes suggested that Supplemental Instruction may have made a positive difference in the performance and retention rates of developmental mathematics students when the instructor was actively involved in promoting the SI group and certain modifications were made to the traditional role of the SI leader in the classroom.

Yates, J., Gill, F., & Webb, C. (1995). *Peer mentoring to facilitate learning in economics.* Conference Proceedings of the Australian Economics Education Symposium, Adelaide, South Australia, Australia.
This paper describes and provides a preliminary evaluation of Supplemental Instruction (SI) used at the University of Sydney (Australia) in an economics course during 1995. Three quarters of the SI leaders listed the following benefits of involvement with the program: improved teaching skills; improved leadership skills; increased confidence; and/or a change in the way they thought about economics.

Yeung, K.-P. (2004). *An evaluation of a Supplemental Instruction programme in a business statistics subject.* University of Hong Kong, Hong Kong, China.

Yockey, F. A., & George, A. A. (2000). The effects of a freshman seminar paired with Supplemental Instruction. *Journal of the First-Year Experience and Students in Transition, 10*(2), 57-76.
This study examines the impact on student performance of one section of a new model of first-year seminar, which is paired with an introductory-level core social science

course. The freshman transition seminar instructor attends the core course, takes notes and exams, does class projects, models good student behaviors, and leads a weekly review of the core course material which is presented in a model similar to Supplemental Instruction (SI). The authors collected data over three semesters on core course grade and semester grade point average for students in the first-year seminar and students in a control group selected from a matched sample. Their results indicate that students in the first-year seminar paired with SI achieved significantly higher grades in the paired core course, attained significantly higher semester grade point averages for the semester of intervention, and had significantly better retention rates after two years than students in the control group.

Zaccagnini, M., & Verenikina, I. (2014). Peer Assisted Study Sessions for postgraduate international students in Australia. *Journal of Peer Learning, 6*(1), 86-102. Retrieved from: http://ro.uow.edu.au/ajpl/vol6/iss1/8.
Peer Assisted Study Sessions (PASS), a peer led academic support program that has multiple documented academic, social, and transition benefits, is increasingly being utilised in Australian institutions. PASS is based on the Supplemental Instruction (SI) model. Whilst PASS has been evaluated from multiple angles in regard to the undergraduate cohort, there is limited research regarding the benefits of PASS for postgraduate students, particularly international postgraduate students. This specific cohort's perspective is significant as international students constitute a large proportion of postgraduate students in Australian universities. This study investigates the role of PASS in contributing to the experience of international postgraduate coursework students at an Australian university through an investigation of its perceived benefits by this cohort of students.

Zaritsky, J. S. (1989). *Peer tutoring: Issues and concerns, results of a survey*. Unpublished manuscript. La Guardia Community College. Long Island City, NY. Retrieved from ERIC database. (ED315134).
In 1988, a survey was conducted to determine the characteristics and extend of peer tutoring program at two- and four-year colleges in New York. Findings included: 95 percent of institutions had at least one peer tutoring program; 2) 41 percent had centralized tutoring labs; 3) institutions most commonly provided Supplemental Instruction in mathematics, biology, business, chemistry, and English; and 4) 96 percent provided peer tutors with training.

Zaritsky, J. S. (1994). *Supplemental Instruction: A peer tutoring program at La Guardia Community College*. Unpublished manuscript. La Guardia Community College. Long Island City, NY. Retrieved from ERIC database. (ED373859)
This report describes the use of Supplemental Instruction (SI) at La Guardia Community College (NY). In spring 1993, an SI program was pilot tested in Principles of Accounting I, Introduction to Economics I and Fundamentals of Human Biology I courses. In Economics I the SI participants received a higher percent of A, B, and C final course grades (37% vs. 27%) and a lower rate of D, F, and course withdrawals (63% vs. 73%). In Economics I the SI participants received a higher percent of A, B and C final course grades (51.7% vs. 43.6%) and a lower rate of D, F and course withdrawals (48.3% vs.

56.4%). In Human Biology I the SI participants received a higher rate of A, B, and C final course grades (63.2% vs. 48.3%) and a lower rate of D, F, and course withdrawals (36.7% vs. 51.7%). Some SI leaders reported personal improvement in the following areas: higher self confidence since they helped other students to do better; increased content knowledge through second review of the course; improved interpersonal communication skills; accelerated emotional and intellectual growth.

Zaritsky, J. S. (1998). *Supplemental Instruction: What works, what doesn't.* Conference Proceedings of the National Association for Developmental Education, Atlanta, GA.
This conference abstract describes the use of Supplemental Instruction (SI) at an urban two-year college (LaGuardia Community College, Long Island, NY). LaGuardia piloted SI in three course in 1993. It now has grown to support more than 20 courses. The average final course grade of SI participants exceeds that of non-participants by approximately a full letter grade. Six key factors were identified for SI programs with positive outcomes for students: SI program supervisor handles multiple roles; college administration is supportive of the program; faculty enthusiasm and support; talented SI leaders; courses selected for SI support have high rates of D, F, or withdrawals; and highly involved SI participants.

Zaritsky, J. S. (1999). *Supplemental Instruction and collaborative learning.* Conference Proceedings of the National Association for Developmental Education, Detroit, MI.
This conference abstract describes the use of Supplemental Instruction (SI) at an urban two-year college (LaGuardia Community College, Long Island, NY). LaGuardia. This paper explores the use of collaborative learning to improve SI: positive interdependence, face-to-face promotive interaction, individual accountability, interpersonal and small group skills, and group processing.

Zaritsky, J. S. (2001). Supplemental Instruction at an urban community college. In J. E. Miller, J. E. Groccia & M. S. Miller (Eds.), *Student-assisted teaching: A guide to faculty-student teamwork* (pp. 103-108). Bolton, MA: Anker Publishing Company. Retrieved from ERIC database. (ED449713).
Supplemental Instruction (SI) is used at LaGuardia Community College in New York to serve an ethnically-diverse student body. After providing a general overview of the SI model, a 1997-98 research study was shared that analyzed the impact of the program with courses in accounting, computer science, biology, and chemistry. Overall mean final course grades favored the SI participants (2.75 vs. 1.65) and higher percentage of successful grades (82% vs. 53%).

Zaritsky, J. S., & Toce, A. (2006). The basic SI model. In M. E. Stone & G. Jacobs (Eds.), *Supplemental Instruction: New visions for empowering student learning* (pp. 23-32). New Directions for Teaching and Learning, No. 106. San Francisco: Jossey-Bass
This chapter describes how SI has since 1993 been successful in improving grades and reducing failure in high-risk coures at LaGuardia Community College, an urban institution.

Zerger, S. (1990). *Supplemental Instruction: Learning through modeling*. Unpublished manuscript. Bethel College. North Newton, KS.
This unpublished manuscript describes the use of Supplemental Instruction (SI) to improve student learning. The paper focuses on explaining how learning occurs in SI, using the social learning theory described in Bandura to do so. According to Bandura, humans can and do learn most things through watching others. This capacity to learn by observation enables humans to acquire large integrated patterns more quickly than if they had to learn all via direct trial and error.

Zerger, S. (1994). Supplemental Instruction in the humanities. In D. C. Martin & D. Arendale (Eds.), *Supplemental Instruction: Increasing achievement and retention* (pp. 41-52). New Directions for Teaching and Learning No. 60. San Francisco, CA: Jossey-Bass, Inc.
Supplemental Instruction sessions in the humanities must differ from those in other disciplines because the epistemology and the axiology differ: a) prior knowledge; b) audience expectations; c) the nature of claims or evidence. Some of the issues important for many SI sessions: need to focus on the big picture; expansion of information rather than data reduction (common in science); careful use of language; importance of writing activities; and role of authority and evidence.

Zerger, S. (1999). *Discipline-specific SI strategies for writing.* Conference Proceedings of the First National Conference on Supplemental Instruction and Video-based Supplemental Instruction, Kansas City, MO.
Research and scholarship in composition theory investigates differences in reading and writing across the academic disciplines. Some of these differences are reflected in vocabulary; patterns of organization; kinds of evidence; documentation; and research methodologies. Due to the unique requirements of the disciplines, some of the following activities might be quite useful for students: preparatory writing, focused timed writings, brainstorming ideas for upcoming papers or reports, peer response to other student writing samples, and summarizing reading assignments.

Zerger, S. (2008). Strategies for adapting Supplemental Instruction to specific academic disciplines. In M. E. Stone & G. Jacobs (Eds.), *Supplemental Instruction: Improving first-year student success in high-risk courses* (Monograph No. 7, 3rd ed., pp. 57-65). Columbia, SC: University of South Carolina, National Resource Center for the First-Year Experience & Students in Transition
This chapter focuses on the adapting of the Supplemental Instruction (SI) model for different academic disciplines. While there are a wide variety of generic or transferable skills that apply in nearly any SI session, there are also a number that are very useful in different academic content areas: humanities and history, natural sciences, and mathematics and engineering,

Zerger, S. (2008). Theoretical frameworks that inform the Supplemental Instruction model. In M. E. Stone & G. Jacobs (Eds.), *Supplemental Instruction: Improving first-year student success in high-risk courses* (Monograph No. 7, 3rd ed., pp. 21-28). Columbia,

SC: University of South Carolina, National Resource Center for the First-Year Experience & Students in Transition
This chapter explores the theories that inform and guide best practices of Supplemental Instruction (SI). Topics explored in the chapter include: behavioral theories and modeling; application of a cognitive model of student learning; Piaget and evolution of the SI model; social interdependence theory and cooperative learning; and critical theory with its empowerment of the student learner. The SI model draws upon all of these theories and creates a meaningful framework to use them appropriately with the SI model to improve student learning and increase student outcomes.

Zerger, S., Clark-Unite, C., & Smith, L. (2006). How Supplemental Instruction benefits faculty, administration, and institutions. In M. E. Stone & G. Jacobs (Eds.), *Supplemental Instruction: New visions for empowering student learning* (pp. 63-72). New Directions for Teaching and Learning, No. 106. San Francisco: Jossey-Bass
Based on the experiences from Nelson Mandela Metropolitan University in South Africa, SI has been useful for faculty members, administrators, and the institution. Si affects faculty and staff development through informal discussions, workshops, trainings, and coursework. The institution benefits through the provision of a professional development programs for its faculty and staff as well as the enhanced outcomes for students.

Zulu, C. (2003). A pilot study of Supplemental Instruction for at-risk students at an Historically Black University (HBU) in South Africa. *Association Internationals de Linguistique Appliqu Review, 16*(1), 52-61.
This article discusses a pilot study during 2002 that sought to evaluate the effectiveness of Supplemental Instruction (SI) at the University of North-West, an historically black university in South Africa. The course under investigation was "Introduction to South African Legal Method and Theory" which first-year law students enrolled. Two questions were investigated: does SI have an effect on students' mastery of content? and does SI have an effect on students' perceptions of their mastery of skills? Three measures were used to evaluate SIL pre and posttests of content knowledge, student perceptions, and final course grades. There was a correlation of higher SI attendance and higher final course grades. The study also revealed barriers and challenges that students experience at the institution. Si was most effective for students who were better prepared academically and for whom English was their first language. These students had more capacity to engage in the SI sessions and gain the most benefit. The author also noted the disadvantage of voluntary SI attendance. Often the students who most needed to be there chose not to attend due to self-reported reluctance to expose their weakness and discomfort due to lacking the skills of the most prepared students. The author recommends that SI attendance be made voluntary and that SI be combined with other academic interventions such as Accelerated Learning Groups developed by Dr. Sydney Stansbury.

Video-based Supplemental Instruction (VSI)

VSI was developed at the University of Missouri-Kansas City in the late 1980s and has been implemented by dozens of institutions in the U.S. and abroad. VSI differs from SI in several respects. The students enroll in required, core curriculum courses. The course professor records all didactic presentations on videotape for use with underprepared students as well as other students who opt for this highly interactive way of learning. Instead of attending the professor's regular lecture classes, students enroll in the *video section* of the professor's course. Students in both sections are held to the same performance standards. Specially designed facilitator and student manuals support the video sections. The International Center for SI can be accessed at http://www.umkc.edu/asm/si/

VSI students, led by a trained facilitator, start and stop the videotaped presentation at pre-determined times and, in addition, whenever they have a question or want clarification. Professors design the video presentations to include periodic small group assignments to insure mastery of one concept before the next is introduced. Students complete these tasks under the supervision and with the guidance of the facilitator. When the taped lecture resumes, the professor models how he/she thinks about the assigned tasks. In this way, the students have time to construct and verify their understanding as well as compare their own thinking to that of the expert.

Arendale, D. R. (1999). *Introduction.* Conference Proceedings of the First National Conference on Supplemental Instruction/VSI, Kansas City, MO.
The author provides an introduction to the conference proceedings of the First National Conference on Supplemental Instruction/VSI held in Kansas City, MO during May 1999.

Arendale, D. R. (2004). Pathways of persistence: A review of postsecondary peer cooperative learning programs. In I. M. Duranczyk, J. L. Higbee & D. B. Lundell (Eds.), *Best practices for access and retention in higher education* (pp. 27-42). Minneapolis, MN: Center for Research on Developmental Education, General College, University of Minnesota.Retrieved from http://education.umn.edu/CRDEUL/monographs.html.
This chapter focused intentionally on a subset of the educational practice that share a common focus with increasing student persistence towards graduation. Rather than a meta-analysis of all published research studies, this chapter is a preliminary review and a description of six models. At the end of the chapter several suggestions are made for differentiating the models from each other and the level of institutional resources and resolve with implementing them. The six student peer learning programs included in this chapter meet the following characteristics: (a) the program must have been implemented at the postsecondary or tertiary level, (b) the program has a clear set of systematic procedures for its implementation at an institution, (c) program evaluation studies have been conducted and are available for review, (d) the program intentionally embeds learning strategy practice along with review of the academic content material, (e) the program outcomes include both increased content knowledge with higher persistence rates, and (f) the program has been replicated at another institution with similar positive student outcomes. From a review of the professional literature six programs emerged: Accelerated Learning Groups (ALGs), Emerging Scholars Program (ESP), Peer-Led Team Learning (PLTL), Structured Learning Assistance (SLA),

Supplemental Instruction (SI), and Video-based Supplemental Instruction (VSI). As will be described in the following narrative, some of the programs share common history and seek to improve upon previous practices. Other programs were developed independently.

Arendale, D. R. (2009). Course-based Learning Assistance (CLA) program guide. In S. Clark-Thayer & L. P. Cole (Eds.), *NADE self-evaluation guides: Best practice in academic support programs* (2nd ed., pp. 105-138). Clearwater, FL: H&H Publishing.
These program standards provide guidance for management of postsecondary peer cooperative learning programs such as Supplemental Instruction (SI), Structured Learning Assistance (SLA), Emerging Scholars Program (ESP), Peer Assisted Learning Program (PAL), and Peer-led Team Learning (PLTL). These standards were developed through extensive field testing of professionals in the field operating these peer learning programs. There are six sections to the chapter: mission and goals; assessment and evaluation; program design and activities; human resources; and value system. The items within each section are divided between essential (important for any peer learning program) and recommended (useful for some peer learning programs due to their design). A more detailed examination of assessment and evaluation of peer learning programs is provided elsewhere in the larger publication.

Arendale, D. R. (2009). Specific assessment and evaluation protocols for Course-based Learning Assistance (CLA) programs. In S. Clark-Thayer & L. P. Cole (Eds.), *NADE self-evaluation guides: Best practice in academic support programs* (2nd ed., pp. 183-193). Clearwater, FL: H&H Publishing.
These program standards provide guidance for assessment and evaluation of postsecondary peer cooperative learning programs such as Supplemental Instruction (SI), Structured Learning Assistance (SLA), Emerging Scholars Program (ESP), Accelerated Learning Groups (ALGs), Video-based Supplemental Instruction (VSI), and Peer-led Team Learning (PLTL). These standards were developed through extensive field testing of professionals in the field operating these peer learning programs. There are four progressive levels of assessment and evaluation: program activity reports, immediate outcomes, short-term outcomes, and longer-term outcomes. The levels within each section are divided among questions to investigate, data needed for collection for analysis, and finally, analysis procedures. Depending on the particular peer learning program, some of these protocols would be more appropriate than others. A more detailed examination of mission, program design, administration, and other issues related to implementation of peer learning programs is provided elsewhere in the larger publication.

Arendale, D. R. (2014). *Annotated bibliography of postsecondary peer cooperative learning programs*. Unpublished manuscript. Department of Postsecondary Teaching and Learning, University of Minnesota. Minneapolis, MN. Retrieved from http://z.umn.edu/peerbib
This annotated bibliography contains all known citations regarding the following postsecondary peer collaborative learning programs: Accelerated Learning Groups, Emerging Scholars Program, Peer Assisted Learning Program, Structured Learning

Assistance, Supplemental Instruction, and Video-based Supplemental Instruction. It has more than 1,100 entries in the following categories: dissertations and thesis papers; books, chapters, and monographs; journal articles; audio and videotapes; newsletter articles; ERIC documents; published conference proceedings; unpublished manuscripts; Internet resources; newspaper and magazine press coverage. In addition to the print version of the document, the web site provides a searchable online database that permits searching by a variety of criteria.

Arendale, D. R., & McLaren, A. (1999). *Supplemental Instruction: Variations on the basic theme.* Conference Proceedings of the Annual Conferences of the Pennsylvania Association of Developmental Educators, Hershey, PA. (ERIC Document Reproduction Service No. ED 428632). Retrieved from http://www.eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/17/77/3c.pdf and https://netfiles.umn.edu/users/arend011/www/peer/SIvariations98.pdf
This paper describes some of the successful variations of Supplemental Instruction (SI). After an initial overview of SI, descriptions about innovations of the model. The first concerns Video-based Supplemental Instruction (VSI). VSI is described as an information delivery system. College students enroll in telecourses that are identical to credit courses delivered live on campus by the same professor. Students enrolled in these VSI course sections attend class eight hours a week rather than three hours since the videotape lectures are frequently stopped to engage in SI session activities. Developmental level students enrolled in VSI course sections earn higher final course grades than the traditional students enrolled in the live course sections. The second variation of the SI model is to use it for faculty development and renewal. Successful models include Salem State College and Anne Arundel Community College. Common activities include: SI leader providing anonymous feedback to the course lecturer; lecturer incorporating SI session activities inside of class sessions; lecturers serving as assistant SI supervisors and expanding their instructional/learning skills by observing other professors; and other associated activities.

Armstrong, L., Power, C., Coady, C., & Dormer, L. (2011). Video-based Supplemental Instruction: Creating opportunities for at-risk students undertaking engineering mathematics. *Journal of Peer Learning, 4*(1), 3-15. Retrieved from http://ro.uow.edu.au/ajpl/vol4/iss1/3.
At the University of Western Sydney (UWS) Australia, the Peer Assisted Study Sessions (PASS) program has been very successful. PASS is based on the Supplemental Instruction (SI) model.Video-based Supplemental Instruction (VSI) provides a more intensive and integrated learning experience based on collaborative processing of pre-recorded lectures for students who lack the prerequisite knowledge to successfully complete the course. Quantitative and qualitative evaluation methods were used to study the effectiveness of VSI with at-risk students enrolled in engineering mathematics. In three of the comparison student groups, the VSI students outperformed peers attending a traditional course. The at-risk VSI participants performed at nearly the same level as the non at-risk students attending the traditional lecture course. The main themes that emerged from the VSI participants were: increase in confidence, higher

understanding of content, positive attitudes towards learning and math in particular, and improved study habits and learning strategies.

Austrell, P.-E., Barmen, G., Bryngfors, L., & Gustavsson, P. (2001). *VSI och "collaborative learning" for att minska variathionen i forkunskaper i mekanik bland nyborjarstudenter.* Conference Proceedings of the Academic Access Conference, Norrkoping, Sweden.

Blanc, R. A., & Martin, D. C. (1994). Supplemental Instruction: Increasing student performance and persistence in difficult academic courses. *Academic Medicine: Journal of the Association of American Medical Colleges, 69*(6), 452-454.
The authors describe the use of Supplemental Instruction (SI) with medical students to earn higher final course grades in historically difficult courses. The SI process has been used successfully with students who are preparing for the USMLE Step I examination. The authors state that SI can strengthen a prematriculation program for students whose MCAT scores place them in the high-risk category for completing the medical school curriculum. To maximize learning efficiency for students in the prematriculation program, the authors suggest that a small-group preview session precedes each lecture and a small-group review follows. The article concludes with a short overview of Video-based Supplemental Instruction (VSI).

Burmeister, S. L. (1996). Supplemental Instruction: An interview with Deanna Martin. *Journal of Developmental Education, 20*(1), 22-24, 26.
This is the transcript of an interview with Dr. Deanna Martin, creator of the Supplemental Instruction (SI) model. Issues discussed in the interview include: new innovations in the SI model; cost effectiveness of the model; use of SI in other countries; current educational climate in higher education; disagreement with mandatory testing and placement of students into tracked developmental education programs; challenges with lecture-based educational delivery systems with increasing student learning mastery; and future opportunities for use of SI and Video-based Supplemental Instruction

Du Plooy, P. (1999). *VSI partnerships, and the transformation of education in South Africa.* Conference Proceedings of the First National Conference on Supplemental Instruction and Video-based Supplemental Instruction, Kansas City, MO.
The issue of partnerships between public and private institutions has been generating a great deal of interest in recent years in South Africa. One example of the development of a private-public partnership in higher education is that of the academic development program, Video-based Supplemental Instruction (VSI). This paper examines the introduction of VSI to South African institutions, in particulate the establishment of a partnership which has evolved to drive this project, and how the VSI program has proved successful as an alternative route into higher education for severely underprepared students. Rather than requiring students to take additional time and spend limited tuition dollars to enroll in remedial courses, students are able to concurrently develop learning strategies while enrolled in rigorous college-level courses.

English, B. J. (1999). *Effects of social integration on the academic performance of international students*. Unpublished manuscript. The University of Southern California. Los Angeles, CA.
This manuscript describes the use of Supplemental Instruction (SI) with postsecondary international students. A comparison is made between SI and the English Language Fellows Program at the University of Rhode Island which has similar purposes. The focus of the sessions is placed more on the use of language as the means for communicating and understanding the course material. The pairing of the native and nonnative speakers of English provides a rich atmosphere for language acquisition and fostering higher comprehension of the course content. The author then explores adapted use of Video-based Supplemental Instruction (VSI) for nonnative speakers as a supplement to challenging courses to aid in language development and mastery.

Fitzgerald, N. (1997). The dropout dilemma. *Careers and Colleges Magazine, 18*(2), 14-17, 26.
This article reviews the causes and cures for the high rate of college drop outs. The author interviewed a number of people for the article. One of those interviewed and quoted in the article is David Arendale, National Project Director for Supplemental Instruction (SI). Arendale describes how SI and its newest variation, Video-based Supplemental Instruction help students to integrate "what to learn" with "how to learn it"

Hester, B. (1992). Course teaches new skills with video. *Arctic College Dialogue Newsletter, 6*(2), 11.
This newsletter article provides an overview of the use of Video-based Supplemental Instruction (VSI) at Arctic College, Iqaluit, Northwest Territories.

Hurley, M., Patterson, K. L., & Wilcox, F. K. (2006). Video-based Supplemental Instruction: Serving underprepared students. In M. E. Stone & G. Jacobs (Eds.), *Supplemental Instruction: New visions for empowering student learning* (pp. 43-54). New Directions for Teaching and Learning, No. 106. San Francisco: Jossey-Bass
This chapter discusses Video-based Supplemental Instruction (VSI), a variation of the SI model that presents options for students who, barring a serious academic intervention, will not be successful in college. Rather than enrollment in developmental-level courses, students enroll in a traditional introductory college course such as Western Civilization or General Chemistry. SI sessions are embedded inside of the lectures rather than waiting until after the lecture periods. Concurrent development of learning strategies along with mastery of rigorous academic content reduces the need for enrollment in prerequisite developmental-level courses.

Hurley, M. A. (2000). Video-based Supplemental Instruction (VSI): An interactive delivery system that facilitates student learning [Ph.D. dissertation, University of Missouri-Kansas City, 1999]. *Dissertation Abstracts International, 61*(04), 1317.
The study focuses on the cognitive and affective results of a small-group learning model called Video-based Supplemental Instruction. There are two hypotheses examined in this study: Students who participate in a Video-based Supplemental Instruction history class will have higher final course grades than a comparable group of students in the

same course in a lecture-format class with the same professor. Students who participate in the Video-based Supplemental Instruction class will have greater self-efficacy, self-confidence and mastery of learning strategies than they had before taking the class. Video-based Supplemental Instruction is an interactive informational delivery system that helps students master course content as they develop and refine reasoning and learning skills. Instructors record their lectures on video tape and enroll students in a video section of the course. A trained facilitator uses the taped lectures to regulate the flow of information to the learner. The lectures are stopped and started as needed, allowing the facilitator to verify that students have comprehended one idea before moving on to the next. Students develop essential reading, learning, and study skills while they master content. The major conclusions from the study were the following: A group of 185 Video-based Supplemental Instruction students received a higher percentage of A's and B's than a comparable group of 185 Non-Video-based Supplemental Instruction students in the same history class over 14 semesters. A group of 185 Video-based Supplemental students received a lower percentage of D's and F's than a comparable group of 185 Non-Video-based Supplemental Instruction students in the same history class over 14 semesters. A larger number of first-year students and African-American students were enrolled in the Video-based Supplemental Instruction history class than was expected. Video-based Supplemental Instruction students learned a variety of strategies which provided them with the academic tools to be successful on their history exams in that class. Video-based Supplemental Instruction students developed a greater sense of self-efficacy in the class. Students developed greater personal confidence because of the Video-based Supplemental Instruction experience. Some Video-based Supplemental Instruction students were unable to sufficiently articulate mastery of course concepts after completing the class.

Hurley, M. P., Kay, Painter, S., & Carnicom, J. (2008). Video-based Supplemental Instruction. In M. E. Stone & G. Jacobs (Eds.), *Supplemental Instruction: Improving first-year student success in high-risk courses* (Monograph No. 7, 3rd ed., pp. 67-79). Columbia, SC: University of South Carolina, National Resource Center for the First-Year Experience & Students in Transition
This chapter focuses on Video-based Supplemental Instruction (VSI), an adaption of the SI model. VSI is an interactive information delivery system that helps students master course content and refine reasoning and learning skills. It provides an alternative to prerequisite or concurrent enrollment in developmental-level coures. Instead, learning strategy practice and mastery is embedded within a course using the VSI learning delivery system. The chapter compares and contrasts SI and VSI, discusses needed implementation steps, and shares VSI evaluation studies.

Koch, E., & Snyders, M. (1997). *The effect of Video Supplemental Instruction on the academic performance in mathematics of disadvantaged students*. Unpublished manuscript. University of Port Elizabeth, South Africa. Port Elizabeth, SA.
This paper examines the effect of Video-based Supplemental Instruction (VSI) on the mathematics performance of students whose metric marks did not enable them to be directly admitted to the Science Faculty at the University Port Elizabeth (South Africa). These students were enrolled in Ethembeni Community College in Port Elizabeth which

serves as a preparation area before admission to UPE. Fifteen students who enrolled in VSI math were matched with 14 students enrolled in a similar math course that required attendance at Supplemental Instruction (SI) sessions. Research suggests that VSI was a more useful instructional delivery system for students with a minimum level of pre-knowledge in mathematics and who study in a consistent and responsible manner. In addition, the researchers suggested the usefulness of VSI in distance learning venues where experienced and trained faculty members are unavailable to deliver live instruction.

Koch, E., & Snyders, M. (1998). *The effect of Video Supplemental Instruction on performance in mathematics in the second semester mathematics special course*. Unpublished manuscript. University of Port Elizabeth, South Africa. Port Elizabeth, SA.
This paper examines the effect of Video-based Supplemental Instruction (VSI) in the second semester mathematics course which enrolled students from Ethembeni Community College in Port Elizabeth which serves as a preparation before admission to the University of Port Elizabeth (South Africa). Students who enrolled in VSI math were matched with students enrolled in a similar math course that required attendance at Supplemental Instruction (SI) sessions. Research suggests that VSI was a more useful instructional delivery system for students with a minimum level of pre-knowledge in mathematics and who study in a consistent and responsible manner.

Landwehr, R. (1995, 1995, July 21). Age of reason: Older students propel universities to shift boundaries, *Kansas City Business Journal,* pp. 21-22.
This newspaper article discusses how a variety of universities are adjusting to the needs and requirements of older students. In an interview with Dr. Kay Blair of the University of Missouri-Kansas City, a short overview of the Video-based Supplemental Instruction (VSI) program is given. Blair listed the following benefits of the VSI program for students: bridges the gap between lectures and learning; helps students to prepare for the rigor of traditional undergraduate courses; fosters collaboration and team-building which are critical skills for the world of work; and taps the individual expertise of the students.

Martin, D. C. (Writer). (1994). Video-based Supplemental Instruction panel discussion [Videotape]. In K. Blair (Producer). Kansas City, MO: Center for Supplemental Instruction, The University of Missouri-Kansas City
This videotape panel discussion provides an overview of the Video-based Supplemental Instruction (VSI) program. Moderated by the creator of SI and VSI, Deanna Martin, the panel was composed of an administrator, faculty member who placed his course on video, former VSI student, and academic advisor who places students in VSI.

Martin, D. C. (1994). *Video-based Supplemental Instruction: An alternative to remedial courses.* Conference Proceedings of the Freshman Year Experience Conference on the First-Year Experience, Columbia, SC. (ERIC Document Reproduction Service No. ED370895)
This article describes the use of Video-Based Supplemental Instruction (VSI) at the University of Missouri-Kansas City. Both a basic overview of the VSI model and a data

study of the pilot study at UMKC. Though the VSI students are less prepared academically than the students in the large lecture class, the VSI group received higher mean final course grades (3.64 vs. 2.41), higher overall reenrollment rates (94 percent vs. 85 percent), and higher reenrollment rates for academic probationary students (100 percent vs. 45 percent).

Martin, D. C., & Arendale, D. R. (Eds.). (1994). *Supplemental Instruction: Increasing achievement and retention*. New Directions for Teaching and Learning No. 60. San Francisco, CA: Jossey-Bass
This monograph features nine chapters concerning: overview and foundation of the Supplemental Instruction (SI) program; use of SI for faculty development; SI in the content areas (humanities, mathematics, chemistry); research studies concerning SI; and the newest innovation of SI called Video-based Supplemental Instruction (VSI).

Martin, D. C., & Arendale, D. R. (1997). *Mainstreaming of developmental education: Supplemental Instruction and Video-based Supplemental Instruction*. Unpublished manuscript. University of Missouri-Kansas City. Kansas City, MO. Retrieved from https://netfiles.umn.edu/users/arend011/www/peer/mainstreamDE97.pdf
This paper describes the development of Supplemental Instruction (SI) and Video-based Supplemental Instruction (VSI) to serve an effective way to mainstream the best features of developmental education into traditional college-level courses. The historical development and modern day implementation of both programs are described

Martin, D. C., & Arendale, D. R. (1997). *Video-based Supplemental Instruction: Interactive video courses*. Unpublished manuscript. University of Missouri-Kansas City. Kansas City, MO. Retrieved rom
https://netfiles.umn.edu/users/arend011/www/peer/VSIanrpt.htm
This report reviews the Video-based Supplemental Instruction (VSI) program initiated at the University of Missouri-Kansas City. The report provides a descriptive overview of VSI as well as numerous data studies concerning its use with high school and college students. Data studies suggest that among college students the VSI participants receive higher final course grades and reenroll at higher rates than the non-participants. VSI at the college level is targeted for students who have a history of academic difficulty (e.g., probation or dismissal) and have lower academic predictors (e.g., lower standardized entrance scores, lower high school percentile rank). As measured by the Learning and Study Strategies Inventory (LASSI), VSI participants show positive gains at the end of the academic term. Data studies of high school students who enroll in VSI courses suggest that they earn higher mean final course grades than college students who do not participate in VSI but enroll in the live section of the same class.

Martin, D. C., Arendale, D. R., & Blanc, R. A. (1997). *Mainstreaming of developmental education: Supplemental Instruction and Video-based Supplemental Instruction*. Unpublished manuscript. University of Missouri-Kansas City. Kansas City, MO. Retrieved from
https://netfiles.umn.edu/users/arend011/www/peer/SIFYEmonograph.pdf

This manuscript was originally delivered as a paper at a special conference in January 1998 on "Alternatives to Developmental Education" that was sponsored by the U.S. Department of Education funded National Center for Lifelong Learning based at Stanford University (CA). The conference was convened to deal with the growing concern by some states regarding traditional developmental education credit courses. The conference was designed to identify several alternative ways of accomplishing the same purposes as developmental courses (e.g., linked courses, critical thinking courses, SI, VSI). This paper first provides an overview of SI and VSI. Then it concludes with the pedagogical basis for both. In developmental education, research scholars embrace the reductionist approach by seeking first to identify the separate and distinct skills required for academic success, then to measure the degree to which these are present or absent in the individual, and finally to isolate and teach those skills that are in deficit. Practitioners assume that mastery of a series of independent skills lead to academic competency. SI and VSI break with this view and provide a holistic approach to education. Given sufficient efficiency on task, effective guidance, and the time and opportunity to do so, any serious student can learn.

Martin, D. C., & Blanc, R. (2001). Video-based Supplemental Instruction (VSI). *Journal of Developmental Education, 24*(3), 12-14, 16, 18, 45.
Developed at the University of Missouri-Kansas City, Video-based Supplemental Instruction© is an interactive information processing and delivery system that helps academically at-risk students master rigorous course content as they concurrently develop and refine reasoning and learning skills. Rather than requiring prerequisite enrollment in a traditional developmental course, VSI is a learning system that mainstreams the best practices of developmental education into historically-difficult core curriculum courses. Research suggests the efficacy of VSI for improving academic achievement for students of diverse levels – from elementary school for children studying mathematics through professional school for future doctors studying to pass the first step of their medical license examination boards. VSI is presented as a holistic alternative to traditional approaches of developmental education

Martin, D. C., & Blanc, R. A. (1994). Video-Based Supplemental Instruction: A pathway to mastery and persistence. In D. C. Martin & D. Arendale (Eds.), *Supplemental Instruction: Increasing achievement and retention* (pp. 83-92). New Directions for Teaching and Learning No. 60. San Francisco, CA: Jossey-Bass, Inc.
The Video-Based Supplemental Instruction (VSI) delivery system using Supplemental Instruction that is described here combines developmental studies with core curriculum courses, offering an alternative to remedial/developmental instruction. Students that are least prepared at the institution need a more powerful academic support service. The difference between the VSI approach and those traditionally used in postsecondary education lies in the centrality of students to the process as opposed to the centrality of the material to be learned: students conduct the preview; students determine the pace of the lecture; students assure their own mastery as the lecture progresses; students select the key points for immediate review; and students identify misconceptions and modify and adapt their conceptions to achieve, eventually, more complete understanding. VSI was designed to allow such students to both earn credit for core

curriculum courses while they develop the requisite learning strategies needed for academic success. This provides an alternative way to provide developmental education.

Martin, D. C., & Hurley, M. (2005). Supplemental Instruction. In M. L. Upcraft, J. N. Gardner & B. O. Barefoot (Eds.), *Challenging & supporting the first-year student: A handbook for improving the first year of college* (pp. 308-319). San Francisco, CA: Jossey-Bass
This chapter provides an overview of Supplemental Instruction (SI). After providing guiding principles of SI, evidence of effectiveness is cited from the original developing site, University of Missouri-Kansas City as well as several other representative institutions. Two adaptations of the SI model are cited: Video-based SI and the Advanced Preparation Program. The chapter closes with recommendations for increasing the effectiveness of SI.

Maxwell, M. (Ed.). (1997). *Improving student learning skills: A new edition*. Clearwater, FL: H&H Publishing
Supplemental Instruction and Video-based Supplemental Instruction are described in several sections of this comprehensive book on developmental education and learning assistance programs. Short selections are contained in Chapter 7, successful programs and strategies for teaching high-risk college students and Chapter 12, increasing science skills.

Nel, P. P. C., Beylefeld, A. A., & Nel, M. M. (1997). *Video-based Supplemental Instruction as an integral part of an academic support and development program.* Conference Proceedings of the Medical education and assessment: Advances in medical education, Maastricht, The Netherlands.
Video-based Supplemental Instruction (VSI) is being used at the University of the Orange Free State (Bloemfontein, South Africa) for academic development and parallel-medium instruction. The paper provides an overview of the VSI program. A study was conducted in the Department of Anatomy and Cell Morphology, Faculty of Medicine with nursing students enrolled for a course in this department. Many of these nursing students are from educationally deprived backgrounds. Data suggests that VSI participants performed at the same level, or higher, than students who do not come from an educationally deprived background.

O'Donnell, L. E. (1995). *Inclusion for learning disabilities: Technology with learning variables research and Supplemental Instruction.* Conference Proceedings of the Empowering children with special needs: Practices around the world, Brighton, United Kingdom.
Learning Variables Research and Supplemental Instruction (LVR/SI) provide an innovative approach to inclusion for intellectually normal and gifted students with learning disabilities. The original Supplemental Instruction (SI) model is generally used with traditional college undergraduate and graduate students. Video-based Supplemental Instruction (VSI) allows enrolled high school or college students view the videotaped lectures of a college level course (e.g., Western Civilization, General

Chemistry) and allow them opportunity to control the flow of information (e.g., stop, repeat, discuss material before proceeding). SI, and especially VSI, can be very helpful for students with learning disabilities since they can be served inside the same content class rather than requiring an additional class for the students to attend to deal with their specialized learning needs. The LVR/SI approach refines either the SI or VSI model with individualized learning variables and computer technology for application in junior high, senior high, and higher education. Rather than using video tape with VSI, computer technology might be substituted. In addition, the SI leader or VSI facilitator is provided critical information about students with disabilities. This technology-based program allows individuals with learning disabilities to succeed academically in integrated, inclusive classrooms.

O'Donnell, L. E. (1996). Inclusion for learning disabilities: Technology with learning variables research and Supplemental Instruction. *International Journal of Special Education, 11*(2), 27-32.
Learning Variables Research and Supplemental Instruction (LVR/SI) provide an innovative approach to inclusion for intellectually normal and gifted students with learning disabilities. The original Supplemental Instruction (SI) model is generally used with traditional college undergraduate and graduate students. Video-based Supplemental Instruction (VSI) allows enrolled high school or college students view the videotaped lectures of a college level course (e.g., Western Civilization, General Chemistry) and allow them opportunity to control the flow of information (e.g., stop, repeat, discuss material before proceeding). SI, and especially VSI, can be very helpful for students with learning disabilities since they can be served inside the same content class rather than requiring an additional class for the students to attend to deal with their specialized learning needs. The LVR/SI approach refines either the SI or VSI model with individualized learning variables and computer technology for application in junior high, senior high, and higher education. Rather than using video tape with VSI, computer technology might be substituted. In addition, the SI leader or VSI facilitator is provided critical information about students with disabilities. This technology-based program allows individuals with learning disabilities to succeed academically in integrated, inclusive classrooms.

Phillips, K. (1999). *Proceedings of the First National Conference on Supplemental Instruction/VSI*. Kansas City, MO: Center for Academic Development, University of Missouri-Kansas City.
This set of conference proceedings provides an overview to the First National Conference on Supplemental Instruction/VSI here in Kansas City, MO in May 1999. Articles include: SI, an effective program within student affairs, Edit Kochenour and Kenneth Roach; Get creative, working with SI data, Jeanne Wiatr and Barbara Stout; SI supporting quality in higher education in the United Kingdom, Jenni Wallace; Managing an expanding program or SI empire, Valeric Merriwether; Supplemental Instruction with math study skills templates, Paul Nolting and Kimberly Ruble; SI down under, Australian innovations, Martin Murray; Distance PALS in real and virtual classes, Judith Couchman; SI leadership and personal grown, a South African perspective, Linda Smith; Discipline-specific SI strategies for writing, Sandra Zerger; VSI, partnerships, and

the transformation of education in South Africa, Paul Du Plooy and Cathy Clark; and SI leaders, the real winners, Maureen Donelan.

Rand, P. (1994). *Video Based Tutorial System for first year nursing students*. Unpublished manuscript. The University of the Orange Free State, South Africa.
This paper describes the use of Video-based Supplemental Instruction (VSI) with nursing students at the University of the Orange Free State in South Africa during 1994. The VSI program was implemented to assist nursing students who were severely academically underprepared. The author reports high satisfaction with the program since low grades were decreased and higher grades were increased in comparison with academic terms that did not have VSI offered.

Snyders, A. J. M. (1999). *Foundation mathematics for diversity: Whose responsibility and what content?* Conference Proceedings of the Delta '99 symposium on undergraduate mathematics, Whitsunday Coast, Australia.
This article describes the issues facing the University of Port Elizabeth in South Africa regarding instruction in foundation mathematics for an increasing diverse student body. Video-based Supplemental Instruction (VSI) and Supplemental Instruction (SI) have been implemented as part of a comprehensive approach. An extensive review of the professional literature concerning mathematics instruction composes the majority of the article.

Sommerfeld, M. (1995). Who's responsible? Taking sides on remedial classes. *Education Week, 14*(29), 1, 14.
This article discusses alternatives to traditional remedial and developmental education programs. Included in the article is a short interview with David Arendale concerning the use of Supplemental Instruction (SI) and Video-based Supplemental Instruction (VSI). One of the difficulties for first-time students is that they concentrate on the wrong things as they prepare for their first examinations.

Staff. (1996, 1996, January 18). Stet R-XV participates in VSI, *Stet Newspaper,* p. 8.
This newspaper article describes the involvement of the Stet High School (MO) with the Video-based Supplemental Instruction (VSI) program. Several Missouri state congressional leaders observed the VSI program operating at the high school.

Staff. (1997, 1997, October 17). Jim Falls: Fun on tape and in person, *UMKC Inside (University of Missouri-Kansas City Newsletter),* p. 1.
This newsletter article describes a report concerning the VSI program. Dr. Jim Falls, one of the professors who has placed his course on video, is featured in the article. Dr. Falls' VSI section of his on-campus introduction to western civilization history class is also accepted for dual high-school credit as well.

Stone, M. E., & Jacobs, G. (Eds.). (2006). *Supplemental Instruction: New visions for empowering student learning*. New Directions for Teaching and Learning, No. 106, San Francisco: Jossey-Bass

This sourcebook includes the following chapters: 1. The impact of Supplemental Instruction on teaching students "how to learn," Saundra Yancy McGuire. 2. The basic SI model,.Maureen Hurley, Glen Jacobs, Melinda Gilbert. 3. Supplemental Instruction at community college: The four pillars, Joyce Ship Zaritsky, Andi Toce. 4. A credit-bearing course for training SI leaders, Sally A. Lipsky. 5. Video-based Supplemental Instruction: Serving underprepared students, Maureen Hurley, Kay L. Patterson, F. Kim Wilcox. 6. Benefits to Supplemental Instruction leaders.M. Lisa Stout, Amelia J. McDaniel. 7. How Supplemental Instruction benefits faculty administration, and institutions, Sandra Zerger, Cathy Clark-Unite, Liesl Smith. 8. New directions for Supplemental Instruction, Sonny L. Painter . 9. TeamSI : A resource for integrating and improving learning, Carin Muhr, Deanna C. Martin. 10. The New vision for SI: Where are we heading ? Glen Jacobs, Marion E. Stone, M. Lisa Stout.

Stone, M. E., & Jacobs, G. (Eds.). (2008). *Supplemental Instruction: Improving first-year student success in high-risk courses* (Monograph No. 7, 3rd ed.). Columbia, SC: University of South Carolina, National Resource Center for the First-Year Experience & Students in Transition
This monograph explores the Supplemental Instruction (SI) model through the following chapters: (introduction) 35 years of SI, F. Kim Wilcox and Glen Jacobs; (1) basic SI model, Maureen Hurley and Melinda Gilbert; (2) research on the effectiveness of SI, Maureen Hurley and Melinda Gilbert; (3) theoretical frameworks that inform the SI model, Sandra Zerger; (4) implementing a new SI program, F. Kim Wilcox; (5) recruiting and training SI leaders, Amelia McDaniel; (6) strategies for adapting SI to specific academic disciplines, Sandra Zerger; (7) Video-Based SI, Maureen Hurley, Kay Patterson, Sonny Painter, and Jennifer Carnicom; (8) SI international adaptations and future directions, Glen Jacobs M. Lisa Stout, and Marion E. Stone; (9) Concluding the first 35 years, Amelia McDaniel; (appendix a) glossary of terms; (appendix b) selected annotated bibliography for SI, David R. Arendale

Stratton, C. B. (1998). Transitions in Developmental Education: Interviews with Hunter Boylan and David Arendale. In P. L. Dwinell & J. L. Higbee (Eds.), *The Role of Developmental Education in Preparing Successful College Students* (pp. 25-36). Columbia, SC: The National Association for Developmental Education and the National Center for the Study of the Freshmen Year Experience and Students in Transition
In this book chapter the author interviews two leaders in the field of developmental education. Hunter Boylan directs the National Center for Developmental Education. David Arendale directs national dissemination of Supplemental Instruction. Both have served as past presidents of NADE. Arendale talks about how developmental education must be "mainstreamed" into the college curriculum rather than continuing with the current model of separate tracks of courses and support for students who need academic assistance. Supplemental Instruction and Video-Based Supplemental Instruction are cited as examples for embedding academic assistance into college-level courses. Brief overviews are provided for both programs. He suggests that SI and VSI present an acceptable way for accomplishing the mission of developmental education which is politically acceptable to policy makers at the institution, state, and national level.

Summers, D. (1995, 1995, December 12). Video-based instruction offers alternatives, *University News (University of Missouri-Kansas City Student Newspaper),* p. 11.
This campus newspaper articles describes the use of Video-based Supplemental Instruction (VSI) to deliver a college introductory history course to students at the University of Missouri-Kansas City. The article provides a brief overview and a few statistics about the higher grades and lower course withdrawal rates for VSI students as compared with students who enroll in the identical course taught by the same professor who previously placed his class lectures on the VSI videotapes.

Villén, V. (2002). *How to prevent student drop outs? An example from Lund University.* (Master's of Arts thesis), Pedagogical Institution, Lund University, Lund, Sweden.
This Master Thesis (written in Swedish) describes how Lund University in Sweden is implementing a variety of programs to deal with student drop outs. Two programs featured in the manuscript are Supplemental Instruction and Video-based Supplemental Instruction.

Whiteside, D. (1995). Capitol News Release of Work. pages of Work. Department. Jefferson City, MO.
This news release provides information about Missouri State Representative Whiteside's visit to see the Video-based Supplemental Instruction (VSI) program as was viewed by a delegation led by him. The VSI program was reviewed at the Mendon, Norborne, and Stet high schools.

Wilcox, F. K., & Jacobs, G. (2010). *Video-based Supplemental Instruction as an alternative to traditional developmental courses*. Unpublished manuscript. Unviersity of Missouri-Kansas City. Kansas City, MO. Retrieved from http://www.postsecondaryresearch.org/conference/PDF/NCPR_Panel3_Wilcox%20Jacobs.pdf
Video-based supplemental instruction (VSI) is a non-traditional course delivery system designed to improve developmental students' academic performance in difficult courses that typically have high failure and withdrawal rates. This paper describes the VSI model and examines data from VSI applications.