

Annotated Peer Bibliography, David Arendale, Publication mentions that faculty report personal or professional growth as a result of having the study group program attached to their class, 86 citations, revised May 17, 2023

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 database. (ED428632)

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.

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.

Bryan, K. N. (2013). *Assessing the impact of faculty-led Supplemental Instruction on attrition, GPA, and graduation rates*. (Ph.D. dissertation), Walden University.

The purpose of this quasi-experimental, quantitative study was to investigate the effectiveness of Supplemental Instruction (SI) as a means to address the existing high attrition and low graduation rates evidenced at a rural southern community college. The research problem addressed the high attrition rates in barrier courses and low graduation rates evidenced at the community college. Students unable to successfully complete barrier courses often alter their educational goals or eventually drop out. Following the constructivism and social constructivism theories, which state that learning is shaped by social interaction, the research questions examined the impact of SI on GPA, graduation rates, and persistence in identified barrier courses. Additional subgroup comparisons between adult learners and traditional students participating in SI were completed. A convenience sample of 70 students currently enrolled in barrier courses was used. Independent samples t tests were conducted and found no significant differences in grades, GPA, or graduation rates for those participating in SI versus those who did not. Independent samples t tests also revealed no significant differences between graduation rates and GPA of adult students versus traditional students participating in SI. Based on the data, the SI model was found to be minimally effective. These findings, along with recommendations to complete a formal, summative evaluation and incorporate professional development training, were presented in the culminating project, a white paper. This study may contribute to social change by helping decision makers properly assess the value of SI to both traditional and nontraditional students, benefiting all who attended the studied site, as well as indirectly impacting the community.

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

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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

Burns, F., & Frank, D. (2012). The use of electronic media for chemical education research. In M.-H. C. e. al. (Ed.), *Chemistry education and sustainability in the global age* (pp. 185-195). New York, NY: Springer Science

During spring 2010, the researcher taught a one-semester survey course of general chemistry (CHEM 114). Some of these chemistry students also elected to participate in the university's Structured Learning Assistance (SLA) Program. These SLA students met with an advanced undergraduate student for extra instruction. SLA students typically outperformed the non-SLA students in many markers for course success in prior semesters. What happens in the SLA sections? The answer to this question could potentially improve the instructor's entire CHEM 114 course and student learning in general. Student learning logs provide a remarkable window into student learning. Since 2007, the instructor has used electronic "learning logs" in the chemistry classroom to improve learning. On a weekly basis, students summarize their week's work: lecture notes, laboratory tasks/experiments, and online homework. Students are also asked to reflect on the past week's work and write down their questions, difficulties, and feelings. As a result, large amounts of high-quality information can be easily collected. Learning logs from SLA students were used to identify SLA activities and related reflections from their perspective. Based upon qualitative analysis, SLA students frequently reported formative evaluation and question and answer sessions as SLA activities. Ultimately, this research illustrates the utility of electronic media for education research and teacher development.

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.

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., & 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 Centre 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

Close, E. W., Conn, J., & Close, H. G. (2016). Becoming physics people: Development of integrated physics identity through the Learning Assistant experience. *Physical Review Physics Education Research*, 12(1), 1-18. doi: <https://doi.org/10.1103/PhysRevPhysEducRes.12.010109>.
<https://journals.aps.org/prper/pdf/10.1103/PhysRevPhysEducRes.12.010109>.

[This paper is part of the Focused Collection on Preparing and Supporting University Physics Educators.] In this study, we analyze the experience of students in the Physics Learning Assistant (LA) program at Texas State University in terms of the existing theoretical frameworks of community of practice and physics identity, and explore the implications suggested by these theories for LA program adoption and adaptation. Regression models from physics identity studies show that the physics identity construct strongly predicts intended choice of a career in physics. The goal of our current project is to understand the details of the impacts of participation in the LA experience on participants' practice and self-concept, in order to identify critical elements of LA program structure that positively influence physics identity and physics career intentions for students. Our analysis suggests that participation in the LA program impacts LAs in ways that support both stronger "physics student" identity and stronger "physics instructor" identity, and that these identities are reconciled into a coherent integrated physics identity. Increased comfort in interactions with peers, near

peers, and faculty seems to be an important component of this identity development and reconciliation, suggesting that a focus on supporting community membership is useful for effective program design.

Close, E. W., Mailloux-Huberdeau, J.-M., Close, H. G., & Donnelly, D. (2020). *Characterization of time scale for detecting impacts of reforms in an undergraduate physics program*. Conference Proceedings of the PERC. <https://www.per-central.org/items/perc/4752.pdf>

Over the past five years, we in the physics department at Texas State University have reformed our calculus-based introductory sequence by implementing a Learning Assistant program, introducing research-based instructional methods, and increasing faculty professional development and instructional mentoring. Students in all sections of these courses now spend a significant portion of class time in small groups, often working through materials from the curricular supplement "Tutorials in Introductory Physics." Over this time, students' normalized gains on the Force Concept Inventory (FCI) have increased dramatically and the DFW rate (the percentage of students receiving a grade of D or F, or Withdrawing from the course) has been cut in half. In addition, we have seen that FCI gains for individual faculty increase gradually over several semesters, for both novice and experienced instructors. These data suggest the need for patience with programmatic reform efforts, and for stability in instructor-course assignments.

Davenport, F., Amezcua, F., Sabella, M. S., & Van Duzer, A. G. (2017). *Exploring the underlying factors in Learning Assistant-faculty partnerships*. Conference Proceedings of the Physics Education Research Conference, Cincinnati, OH. <https://par.nsf.gov/servlets/purl/10108219>

An effective Learning Assistant (LA) Program provides benefits for both Learning Assistants (LAs) and faculty, in addition to benefits for students. By analyzing LA and faculty reflections, weekly preparation sessions, and interviews with LAs and faculty, we can better understand the partnerships that develop between faculty and their LAs. We leverage a combination of qualitative and quantitative data to investigate the types of LA expertise and skills faculty value and how this affects the formation of these partnerships. The Preparation Session Observation Tool (PSOT), developed from this work, can be used by LAs, LA Program Coordinators, and faculty to reflect on the types of LA partnerships that emerge, and how these partnerships can be used in constructing effective learning environments. We anticipate that this tool can then be used to help LAs, coordinators, and faculty modify their working relationship to develop the type of partnerships that are best for their particular instructional setting. PSOT provides a finer-grained analysis to three broad partnership classifications that exist along a continuum: mentor-mentee, faculty-driven collaboration, and collaborative.

Diegelman-Parente, A. (2012). *The scholarship of Peer-led Team Learning: My progression from student leader to faculty*. Conference Proceedings of the Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. www.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. 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>.

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.

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 particular 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.

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.

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

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.

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.

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.

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.

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. (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.

Kemppainen, A., Hamlin, A. J., & Diment, H. (2017). *LEarning with academic partners (LEAP) Success and growing pains in the first year* Conference Proceedings of the IEEE Frontiers in Education.

Supplemental Instruction (SI) is a technique that has been shown to be successful in supporting students in historically challenging courses and improving grades and retention [1]–[3]. SI was started at the University of Missouri-Kansas City (UMKC) in 1973, but has since branched out to approximately 1500 institutions in 30 countries. The program benefits all areas of an institution: students, SI leaders, faculty, and administration. The students benefit by developing a deeper understanding of the course material as they work closely with and are mentored by an SI leader. Mentoring occurs with students who are close in age and have a working knowledge of the environment in which the mentee is meant to operate in [4]. Mentoring allows students to develop coping skills necessary for success. This technique works particularly well for students who would not normally seek assistance [5]. Successful mentoring emphasizes the student's strengths, leading to increased self-efficacy and retention. The SI Leaders develop leadership and facilitation skills as well as increased skill in the course material. Faculty benefit by using their SI leaders to connect them with students: their problems, areas of confusion, and learning challenges. Finally, the administration benefits by increased retention at the University

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.

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. (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.

Kodabux, A., & Hoolash, S. K. A. (2015). Peer learning strategies: Acknowledging lecturers' concerns of the Student Learning Assistant scheme on a new higher education campus. *Journal of Peer Learning*, 8(1), 59-84. www.ro.uow.edu.au/ajpl/vol8/iss1/7/.

While this article is not directly based on Supplemental Instruction or names commonly used in other countries such as Peer Assisted Learning or Peer Assisted Study Sessions, the authors do describe their program as similar. The article addresses an issue seldom addressed in most of the literature about how peer learning is perceived by the faculty members that host the program within their courses. For that reason, it is included. The rest of this abstract comes from the authors' words: The Student Learning Assistant (SLA) scheme was introduced in 2010 at Middlesex University Mauritius Branch Campus (MUMBC). The scheme is similar to traditional peer learning strategies, such as Peer Assisted Learning (PAL) and Peer Assisted Study Sessions (PASS), which are widely operated in higher education environments to motivate student engagement with their learning. Different departments at MUMBC employ the SLA scheme as a student-to-student support mechanism. General feedback from students receiving SLA support reveals benefits of the scheme in terms of students' active engagement with course materials and deeper understanding of their subject area. However, within these departments, lecturers' perceptions of the scheme are surprisingly varied. Since the 1970s, a comprehensive range of research has been undertaken on the expansion of peer learning and the welcome benefits it affords to students. Yet, the focus on student experience has been at the expense of overlooking lecturers' views of the scheme. This paper seeks to bridge this gap. It aims to examine lecturers' experience of the scheme and to recommend actions to overcome some of their apprehension with the project.

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.

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 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.

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., & 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.

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.

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.

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. 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.

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., & 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., & 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. www.arendale.org/storage/pdf-documents/peer/MainstreamingDE97.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. 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 database. (ED393486).

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.

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., & 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.

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.

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.

McHenry, N., Martin, A., Castaldo, A., & Ziegenfuss, D. (2010). Learning Assistants Program: Faculty development for conceptual change. *International Journal of Teaching and Learning in Higher Education*, 22(3), 258-268. <http://files.eric.ed.gov/fulltext/EJ938561.pdf>.

The purpose of this study was to investigate the effects of a student-centered faculty development model on the conceptions of teaching of participating US Arts and Sciences faculty members. "Student-centered learning models are widely accepted as catalysts for improved learning and psychosocial outcomes, and their use is especially important in the critical early years of an undergraduate education" (Miller, Groccia, & Miller, 2001, p. xv). In 2007-2008, Widener University implemented a pilot program to investigate student-assisted teaching, an instructional process where undergraduates are given responsibility by faculty for portions of their fellow undergraduates' learning experience. This Learning Assistant Program (LAP) investigated a faculty development model that could improve educational effectiveness by increasing student involvement in course design, student learning, and pedagogy. In this study, two faculty collaborated with three student learning assistants (LAs), under the direction of two pedagogy coaches to redesign courses and monitor progress of those courses during one semester. Findings from this qualitative study indicate increased satisfaction of faculty with their course designs, accompanied by increased knowledge about course design strategies and pedagogical teaching methodologies; a broadening of both the faculty and LA conceptions about teaching and learning; and the development of an academic collaborative culture. The success of this program has initiated a LAP in the University's School of Human Service Professions and another iteration was implemented at a local community college.

Merkel, J. C. (2015). Assessment of Peer-led Team Learning in calculus I: A five-year study. *Innovative Higher Education*, 40(5), 415-428. doi: 10.1007/s10755-015-9322-y.

This five-year study of the peer-led team learning (PLTL) paradigm examined its implementation in a Calculus I course at an all-male HBCU institution. For this study we set up a strong control group and measured the effect of PLTL in the teaching and learning of Calculus I through two points of measure: retention and success rates and learning gains. Our analysis reveals those aspects that can make the implementation of PLTL in calculus and perhaps in mathematics in general challenging and also shows hopeful aspects that promote better learning of the subject.

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.

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). www.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 curriculum 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.

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.
www.econ.mq.edu.au/Econ_docs/research_papers2/2004_research_papers/PALDec04.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 key skills such as leadership, communication, group management; deeper understanding of course content; valuable enhancement to employability; and financial payment.

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.

Otero, V. K., & Alicea-Munoz, E. (2023). Research on the development of faculty, graduate teaching assistants, and undergraduate learning assistants. In M. F. Tasar & P. R. L. Heron (Eds.), *The international handbook of physics education research: Teaching physics* (pp. 16-11-16-20). Melville, New York: AIP Publishing

<https://pubs.aip.org/books/monograph/160/chapter-split/81720171/Research-on-the-Development-of-Faculty-Graduate>.

This chapter explores the literature that investigates how physics instructors are supported when building learning environments that capitalize on research-based instructional strategies. The research demonstrates the value of real-time, context-specific, faculty development models that explicitly build on their knowledge and experience. Similarly, the research on Graduate Teaching Assistants highlights the value of their training being situated in teaching practice and the value of Graduate Teaching Assistants feeling like a part of the instructional team, in partnership with faculty members who lead a course. The Learning Assistant model is presented in this chapter as a real-time, context-specific solution to faculty development, where Learning Assistants, Graduate Teaching Assistants, and faculty members serve on an instructional team that is supported by LA program staff in their mission to improve their instruction and increase student voice in the classroom.

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.

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 database. (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.

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 growth, 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.

Pollock, S. J., & Finkelstein, N. D. (2007). *Sustaining change: Instructor effects in transformed large lecture courses*. Conference Proceedings of the AIP.

https://www.researchgate.net/profile/Steven-Pollock-2/publication/237472463_Sustaining_Change_Instructor_Effects_in_Transformed_Large_Lecture_Courses/links/0046352b3681adbade000000/Sustaining-Change-Instructor-Effects-in-Transformed-Large-Lecture-Courses.pdf

We investigate the transfer of classroom reforms from PER faculty to more traditional physics-research faculty. This study is part of an ongoing effort to assess necessary and sufficient requirements for success with research-based course transformations. We have previously demonstrated the ability of PER faculty to replicate the success that other researchers achieve when implementing research-based reforms in large, introductory calculus-based physics courses. Here, we present new data from four implementations of Physics II

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.

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.

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 as 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 feedback mechanism to identify the comprehension level of the students regarding the classroom lectures.

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.

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," Sandra 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.

Stout, B., & Wiatr, J. (2002). Supplemental Instruction (SI): Faculty support and the SI program. *The Learning Center Newsletter*. 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.

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.

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. doi: 10.1021/ed081p1313.

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.

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.
www.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 (CINS, 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 inventories 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.

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.

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. 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.

Webb, D. C., Stade, E., & Grover, R. (2014). Rousing students' minds in postsecondary mathematics: The undergraduate Learning Assistant Model. *Mathematics Education*, 5(2). doi: <https://doi.org/10.7916/jmetc.v5i2.653>.
<https://journals.library.columbia.edu/index.php/jmetc/article/view/653/99>.

This article presents several of the challenges facing postsecondary mathematics education and describes how the undergraduate Learning Assistant (LA) program has been used as a catalyst to engage faculty and students in redesigning opportunities to learn mathematics. Characteristics of the LA program that have been used to transform introductory undergraduate science courses are discussed. We then describe how the LA program was implemented in a mathematics department vis-à-vis the specific contextual features of a mathematics department at the University of Colorado Boulder.

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 than 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 reported 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.

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. (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. (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.

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. (1988). *Supplemental Instruction with mentoring support at Anne Arundel Community College*. Conference Proceedings of the Midwest College Learning Center Association Conference., Chicago, IL. ERIC database. (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. 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.

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.

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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.

