Annotated Peer Bibliography, David Arendale, Facilitator of Participants Experience Sence of Comfort
154 Citations, revised May 17, 2023

Aldridge, J. N. (2011). *From access to success in science: An academic-student affairs intervention for undergraduate freshmen biology students.* (Ed. D. dissertation), University of Delaware.

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

Arendale, D. R., & Hane, A. R. (2014). Holistic growth of college peer study group participants: Prompting academic and personal development. *Research & Teaching in Developmental Education, 31*(1), 7-29. University of Minnesota Digital Conservancy, www.hdl.handle.net/11299/200358.

This qualitative study focused on observed changes in personal and professional attitudes and behaviors by the students that participated in the Peer Assisted Learning (PAL) group at the University of Minnesota. The Peer Assisted Learning (PAL) program at the University of Minnesota is a primary academic support program for historically difficult, introductory college courses that serve as gatekeepers to academic degree programs. Based upon operating principles of other programs and educational theories, PAL is integrated into the courses it serves. The PAL model is based on best practices from several national peer learning models including Supplemental Instruction, Peer-led Team Learning, and the Emerging Scholars Program. Arthur Chickering's Comprehensive Theory of Personal Change was used to analyze the data. Four themes emerged: higher levels of engagement, higher confidence, increased interpersonal skills, and improved critical thinking skills. Higher engagement with the learning process was manifested through them talking more, displaying more comfort while speaking, and asking questions of the PAL facilitators and others in the group. Increased confidence was evidenced by a reduction of frustration and fear and replaced with displays of new cognitive and metacognitive thinking, expressions of self-confidence in ability to solve problems and learn new academic content independently. Increased interpersonal skills was higher rates of interaction within the study group, helping others during small group activities and within the large group discussions, making friends with the participating students and the facilitator, and actively working with fellow students to solve problems rather than preferring self-reliance and working alone. The final theme of improved critical thinking was displayed by increased ability to understand and explain the reasoning behind concepts. The article concludes with several recommendations how study group programs could become more intentional with fostering personal and professional growth of the study group participants and also areas for further research in this area.

Armstrong, L., Power, C., Coady, C., & Dormer, L. (2011). Video-based Supplemental Instruction: Creating opportunities for at-risk students undertaking engineering mathematics. *Journal of Peer Learning, 4*(1), 3-15. www.ro.uow.edu.au/ajpl/vol4/iss1/3/.

At the University of Western Sydney (UWS) Australia, the Peer Assisted Study Sessions (PASS) program has been very successful. PASS is based on the Supplemental Instruction (SI) model. Video-based Supplemental Instruction (VSI) provides a more intensive and integrated learning experience based on collaborative processing of pre-recorded lectures for students who lack the prerequisite knowledge to successfully complete the course. Quantitative and qualitative evaluation methods were used to study the effectiveness of VSI with at-risk students enrolled in engineering mathematics. In three of the comparison student groups, the VSI students outperformed peers attending a traditional course. The at-risk VSI participants performed at nearly the same level as the non at-risk students attending the traditional lecture course. The main themes that emerged from the VSI participants were: increase in confidence, higher understanding of content, positive attitudes towards learning and math in particular, and improved study habits and learning strategies.

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

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

Bartlett, G., Terblanche, N., & Eastmond, J. N. (1996). *The politics and process of student involvement in a programme of Supplemental Instruction*. Paper presented at the South African Association for Academic Development Conference, University of Fort Hare, Republic of South Africa.

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

Beasley, C. J. (1997). *Students as teachers: The benefits of peer tutoring.* Conference Proceedings of the 6th Annual Teaching Learning Forum, Murdoch University.

Supplemental Instruction (SI) has been customized for use at several institutions in Australia. Program results for SI participants include: improved understanding and performance in the subject area involved, improved confidence and study skills, as well as on-going friendships. SI leaders also report improvement in content knowledge and personal skills. This paper focuses quantitative and qualitative analysis concerning the use of SI at Murdoch University with business students in 1995. The two courses studied were Principles of Commercial Law and Introduction to Accounting. Many of the participants were international students.

Bermingham, N., Boylan, F., & Ryan, B. J. (2022). Evaluating a Peer Assisted Learning programme for mature access foundation students undertaking computer programming at an Irish university. *Journal of Peer Learning, 14*(1), 52-70. https://ro.uow.edu.au/ajpl/vol14/iss1/5.

Access Foundation Programmes are a widening-participation initiative designed to encourage engagement in higher education among underrepresented groups, including those with socioeconomic and educational disadvantage. In particular, mature students enrolled in these programmes experience greater difficulties making the transition to tertiary education, especially when they opt to study disciplines traditionally considered difficult. Computer programming is perceived as a traditionally difficult subject with typically lower pass rates and progression rates than other subjects. This paper describes the first of a three-cycle action research study examining the perceived effects of a structured Peer Assisted Learning (PAL) Programme for mature students enrolled in a computer science programming module for an Access Foundation Programme in an Irish University. The focus of this qualitative study was to evaluate the perceived effect of a PAL programme on learning and whether it offered a positive learning support structure. Findings from our study suggest that PAL programmes have an overall positive effect on subject comprehension as well as enhanced learner confidence for mature Access Foundation students. Furthermore, PAL sessions offered students a support structure that helped with their transition and acculturation to tertiary education. This study also highlights the importance the PAL leader’s role has on the perceived effectiveness of the PAL sessions as well as the impact of the students’ shared history on the near-peer bond. The study concludes that the implementation of PAL programmes for Access Foundation Programmes has the potential to offer

mature students a supportive learning environment and to improve their learning experience.

Bermingham, N., Boylan, F., & Ryan, B. J. (2022). The 4C's of PAL: An evidence-based model for implementing peer assisted learning for mature students. *Innovations in Education and Teaching International*, 1-11. doi: https://doi.org/10.1080/14703297.2022.2050779. https://www.tandfonline.com/doi/epdf/10.1080/14703297.2022.2050779?needAccess=true&role=button.

Peer Assisted Leaning (PAL) programmes have been shown to enhance learner confidence and have an overall positive effect on learner comprehension, particularly in subjects traditionally perceived as difficult. This research describes the findings of a three-cycle Action Research study into the perceived benefits of implementing such a programme for mature students enrolled on a computer science programming module on an Access Foundation Programme in an Irish University. The findings from this study suggest that peer learning programmes offer students a valued support structure that aids transition and acculturation into tertiary education whilst simultaneously improving their subject-matter comprehension and confidence. An evidence-based model of PAL implementation for mature students was subsequently developed, underpinned by the associated pedagogic theory and the findings of the study. Our model promotes a student-focused peer educational enhancement framework that is transferable into the wider higher education setting.

Best, G., Hajzler, D., Ivanov, T., & Limon, J. (2008). Peer mentoring as a strategy to improve paramedic students' clinical skills. *Australasian Journal of Peer Learning, 1*, 13-25. www.ro.uow.edu.au/ajpl/vol1/iss1/4

This paper documents the rationale and outcomes of a peer mentoring program based on Supplemental Instruction (SI) in which selected third year paramedic students took on the role of mentors within a second year clinical practice subject. Participating students reported an improvement with their clinical skills. At Victoria University in Australia the SI program has been customized and renamed Peer Assisted Study Sessions (PASS). This approach was designed to improve students' clinical skills and judgment and to improve their confidence and use of clinical equipment. The PASS mentors reported gains in assistance with projects, revitalized interest in work, and increased self-confidence. Mentees reported increases in their learning and development, increased personal support, and an increase in confidence. The program also provided students with a leadership role to extend their own competency with the content material. The authors suggested that the PASS program could be enhanced in the future to further improve its impact on leadership development of the mentors.

Brown, T. P., Becvar, J. E., Noveron, J. C., & Saupe, G. (2012). *No stupid questions.* Conference Proceedings of the Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. www.pltlis.org/wp-content/uploads/2012%20Proceedings/Brown-2012.docx

In general chemistry peer-led workshops at the University of Texas at El Paso, we place great emphasis on the establishment of mutual trust between students and the peer leader from the get-go. This generates a positive learning team where students develop a high degree of comfort and are not afraid to ask questions, even questions so basic as to be referred with the ugly expression 'stupid questions'. Workshops include hands-on, experimental activities called Explorations. These spark curiosity and lead to many questions. Students are generally not comfortable enough to ask questions in lecture; providing PLTL workshops directly addresses this issue. Comfort and trust in Workshop creates a learning environment where students are not afraid to ask questions of any type, where those student-led questions help eliminate the simple memorization of facts, and where students are able to think and act as problem-solvers to comprehend concepts.

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

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

Cantwell, S., Bonadurer, G. F., Pawlina, W., & Lachman, N. (2015). Near-peer driven dissection selective: A primer to the medical school anatomy course. *Clinical Anatomy, 28*, 985-992. doi: 10.1002/ca.22630.

In the anatomy laboratory, skill remains a critical component to unlocking the true value of learning from cadaveric dissection. However, there is little if any room for provision of instruction in proper dissection technique. The

researchers describe how near-peer instructors designed a supplemental learning activity to enhance the dissection experience for first-year medical students. This study aimed to evaluate the efficacy of this curriculum in improving participants' understanding of dissection technique and its impact on perceived challenges associated with the anatomy course. Curriculum was designed under faculty guidance and included didactic sessions, low-fidelity models, dissection, student presentations, and clinical correlations. Participants' (n = 13) knowledge of basic dissection techniques and concepts were assessed before the selective, and both participants' and nonparticipants' (n = 39) knowledge was assessed at the end of week one and week seven of the anatomy course. Scores were compared using repeated measures ANOVA followed by post hoc t-tests. Thirteen deidentified reflective essays were reviewed by four independent reviewers for themes that aligned with learning objectives. Participants in the selective course scored higher on assessment of dissection techniques and concepts one week after the selective compared to both nonparticipants and their own baseline scores before the selective. Analysis of student reflections resulted in four themes: confidence with dissection skill, sharing resources and transfer of knowledge, learning environment, and psychological impact of perceived challenges of the anatomy course. Near-peer driven supplemental exercises are effective in facilitating dissection skills. This dissection primer increases student confidence and alleviates apprehension associated with anatomy courses.

Capstick, S. (2004). *Benefits and shortcomings of Peer Assisted Learning (PAL) in higher education: An appraisal by students*. Unpublished manuscript. Bournemouth University. Bournemouth, United Kingdom.

The benefits and shortcomings of a Peer Assisted Learning (PAL) scheme [based upon Supplemental Instruction] are described from the perspective of its student participants. Qualitative methodology is used to investigate and describe student outcomes, together with an analysis of influence of PAL on marks in one course. A wide range of benefits are reported for students engaged in PAL, as well as for those students responsible for managing PAL discussion groups. PAL leaders improved presentation skills, group speaking, and confidence. Some PAL leaders said the experience helped them during job interviews as well as promoting interest in teaching as a career. Negative aspects of PAL as described by the PAL leaders was the rule that they are not permitted to make short lectures to clear up confusion by the participants. This rule is common among British SI-like programs to clearly define how SI is different than what professional tutors and the course instructor does. It is argued that qualitative benefits of PAL are more pronounced and demonstrable, and more appropriately portray the scheme, than quantitative outcomes.

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.

Chase, A., Rao, A., Lakmala, P., & Varma-Nelson, P. (2020). Beyond content knowledge: Transferable skills connected to experience as a peer leader in a PLTL program and long-term impacts. *International Journal of STEM Education 7*(29), 1-10. doi: www. .org/10.1186/s40594-020-00228-1. www.link.springer.com/content/pdf/10.1186/s40594-020-00228-1.pdf.

Background: Being a successful peer-led team learning (PLTL) workshop leader involves developing content knowledge and workshop facilitation skills. These skills connected to being a peer leader, however, do not terminate at the end of one’s undergraduate program. In fact, many former peer leaders denote having been a peer leader on their LinkedIn profile. This study examines the transferable skills that former peer leaders identified as being valuable in their current positions. We conducted semi-structured interviews with former peer leaders from varying disciplines, universities, ages, and years since being a peer leader. Results: Interview questions captured leadership experiences including successes and challenges of being peer leaders, roles and responsibilities, and specific transferable skills further developed by being peer leaders and how they are being utilized in the leaders’ current position. Conclusion: Thematic analyses of these interviews indicate that former peer leaders recognize leadership skills, coping with many challenges (including not having the right answer), collaboration/teamwork skills, self-confidence, and problem-solving skills as being relevant and frequently used in their current work.

Cheatle, J., & Sanchez, C. L. (2021). Wrotomg center ambassadors: Engaging campus organizations through

embedded consultants *Praxis: A Writing Center Journal, 18*(3), 41-51. https://repositories.lib.utexas.edu/bitstream/handle/2152/87763/389.%20Author%20Approved%20Proof%20SU.2021--Paginated%2041-51%20%281%29.pdf?sequence=2.

This work examines a program developed by the Michigan State University Writing Center to embed consultants within existing programs and organizations at the institution. Specifically, a writing center consultant was embedded in the College Assistance Migrant Program, an educational program for individuals with migrant or seasonal farm work backgrounds. Drawing on the theoretical framework of embedded tutoring, this program successfully fostered improved relationships and understanding between the writing center and faculty, staff, and students in the student organization. Both CAMP administrators and students found benefits from the program. Administrators became more thoughtful as they interacted with the center, an important student service, as well as giving them a better idea of the services that the center provides. Students, meanwhile, were more comfortable using the center's services because those services were identified with the Ambassador, someone that they were able to get to know well because of their frequent presence in the CAMP offices. And the writing center benefits as well – the Ambassador Program is a way to reach out with and connect with groups of students who may be "non-visitors" in order to turn them into "visitors." Included as part of this work is the mixed-methods assessment to determine the success of the program as well as recommendations for other writing centers who may want to utilize this type of programming.

Chilvers, L. (2016). Communities of Practice for international students: An exploration of the role of PASS in supporting transition and learning in higher education. *Journal of Learning Development in Higher Education, Peer Learning Special Edition Part 2* (April). www.aldinhe.ac.uk/ojs/index.php?journal=jldhe&page=article&op=view&path%5B%5D=366&path%5B%5D=pdf.

In the context of the growing internationalization of Higher Education (HE) (DeVita and Case, 2003), research evidences a variety of challenges and potential barriers to international students' transition into, and participation in, HE abroad (Krause, 2005). These can include homesickness, culture shock, loneliness and difficulties learning in English as a Second Language (ESL) (Jones and Fleischer, 2012a; Caruana and Spurling, 2007; Burns, 1991). These difficulties highlight the need for increased support for internationals, particularly in their first year (Anderson et al., 2009; Forland, 2006). This need for support is a common trend across UK HEIs (Yorke and Longden, 2008) and is reflected in the retention data for the host institution of this research (Jones and Fleischer, 2012b). Between 2006/7 and 2010/11, international students' non-continuation rates increased each year at a faster rate compared to home students. There has been a steady improvement in international student retention since then, although it is still above the UK national benchmark. The social learning concept Communities of Practice (CoP) (Lave and Wenger, 1991) describes a community of people, joined together by shared interests and a mutual participation in a particular practice. Research evidences the cultivating of student learning communities as an effective approach for supporting students in their academic, social and emotional adjustment to HE (Zhao and Kuh, 2004; Lenning and Ebbers, 1999). This positively impacts students' engagement, retention and overall satisfaction with their student experience (Zhao and Kuh, 2004; Tinto et al., 1994). Learning communities comprise of students who have regular contact with one another for the purpose of active, collaborative learning and socialising (Zhao and Kuh, 2004). Peer Assisted Study Sessions (PASS) is a peer learning scheme aimed at fostering a course-based learning community, evidenced in helping students to develop confidence, friendships, study skills and their understanding of course material (Fostier and Carey, 2007; Coe et al., 1999; Arendale,1994).

Chilvers, L., & Waghome, J. (2018). Exploring PASS leadership beyond graduation. *Journal of Peer Learning, 11*(1), 5-26. www.ro.uow.edu.au/cgi/viewcontent.cgi?article=1137&context=ajpl.

Developing University graduates' employability is of increasing strategic institutional focus in the UK. Existing research evidences the role of Peer Assisted Study Sessions (PASS) in supporting students to develop personal, professional and employability skills. This research explores the impact of the PASS Leader role on graduates' job application experiences, their employability and effectiveness in their current roles. PASS Leader graduate survey (n=62) and interview (n=12) findings demonstrated participants referred to their PASS Leader Role significantly on their CVs, application forms and in job interviews. Respondents said that PASS Leadership, aided by reflection, enabled them to clearly evidence their development of employability skills, which they perceived as enabling them to stand out from other job candidates. Interview participants explained their PASS Leadership informed their development of a range of employability skills and attributes, including communication, confidence, teamwork, facilitation and leadership. PASS Leadership was regarded as addressing gaps in their course curriculum for developing skills they perceived as important for their current roles, highlighting the value of co and extra-curricular programmes, such as PASS.

Clark, C., & Koch, E. (1997). Supplemental Instruction for the South African context: A case study at the University of Port Elizabeth. In R. B. Ludeman & S. Hubler (Eds.), *Quality student services around the world: Bridging student needs and student success* (pp. 124-146). Washington, D.C.: National Association of Student Personnel Administrators

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

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.

Clulow, V. G. (2000). An analysis of a peer tutoring experience in a first-year business subject. *Journal of Institutional Research, 9*(1), 89-99.

This article describes a study of the use of Supplemental Instruction (SI) in an introductory business course in Australia called statistics for marketers .This study focused on the students' perceptions of the influence of SI as a learning strategy. Positive outcomes for the participating students included:freer flow of questions about the course material, less inhibition to participate in the discussion, greater confidence that they problems were not isolated, better understanding of the course material, environment to express their questions in an unhurried manner and know that they were heard, and finally the opportunity to work through a problem until they had understood it.

Cofer, R. (2022). *Perceived gains of the peer tutor and Supplemental Instruction leader experience.* (Ph.D. dissertation), Georgia Southern University. https://digitalcommons.georgiasouthern.edu/cgi/viewcontent.cgi?article=3594&context=etd

This study explored the peer tutor and Supplemental Instruction (SI) Leader experiences in the campus learning center, as seen through the perceived gains in three subcategories: 1) academic performance and learning, 2) non-academic skillsets, and 3) self-confidence and fulfillment. The peer tutor and SI Leaders surveyed in this study had experience in either one or both of these peer educator roles and came from institutions across the nation. In this quantitative study, participants completed a three-part, researcher-created survey

that allowed for Likert-scaled responses along with open-ended responses and concluded with demographic items. The major findings from this study showed a significant difference in the perceived gains of the peer educators based on their roles, with tutors reporting greater perceived gains than the SI Leaders. Additionally, the study found that these peer educators perceived the most gains in non-academic skillsets, specifically related to increases in their communication and listening skills. However, there was no statistically significant difference in these perceived gains in terms of the length of time served in the roles. Implications for practice are related to potential increased funding for campus learning centers as well as peer educator training content that considers these gains. Future research on the peer educator experience in the campus learning center could examine these gains in relation to other variables, such as race and type of institution.

Cofer, R., McBrayer, J. S., Zinskie, C., Wells, P., & Fallon, K. (2022). Perceived gains of peer educators in campus learning centers: Academic performance and learning, non0academic skillsets, and self-confidence and fulfillment. *Journal of Peer Learning, 15*, 17-31. https://ro.uow.edu.au/ajpl/vol15/iss1/3.

This study explored the peer tutor and Supplemental Instruction (SI) Leader experiences in campus learning centers as seen through the perceived gains in three subcategories: 1) academic performance and learning, 2) non-academic skillsets, and 3) self-confidence and fulfillment. The peer tutors and SI Leaders surveyed in this study had experience in one or both of these roles and came from institutions across the nation and from several international institutions. In this quantitative study, participants completed a researcher-created survey. The major findings showed a significant difference in the peer educators' perceived gains based on their roles, with tutors reporting greater perceived gains. Additionally, the study found that these peer educators perceived the most gains in non-academic skillsets, specifically related to increases in their communication and listening skills as well as skills for future careers. When examining the perceived gains in relation to the role and the length of time in that role, the peer tutor role was found to be significant in all three subcategories, whereas the length of time in that role did not present significant differences. Implications for practice support the need for increased resource allocation, showing that learning centers impact more than the students the peer educators serve.

College, P. A. (2021). *Embedded tutoring in high-challenge courses*. https://www.alamo.edu/siteassets/pac/about-pac/accreditation/quality-enhancement-plan-9-13-21.pdf

Palo Alto College is a federally designated Hispanic-Serving Institution (HSI) of approximately 11,000 students located on the southside of San Antonio, an area historically underserved by the K-12 public school system. The student population of this urban community college is 77% Hispanic, 62% female, and overwhelmingly part-time (87%). Starting in August 2019, a series of college-wide presentations created the backdrop for the selection of a Quality Enhancement Plan (QEP) topic grounded in the College's quest for continuous improvement. Presentation topics included the 2019-2024 Strategic Plan, the College's Key Performance Indicators (KPIs), and current institutional and student data. Concurrent with the campus-wide data review, an employee survey was launched to identify possible QEP topics. In January 2020, a student survey was conducted to identify students' perceptions of the challenges that impeded their success as learners. Four key themes emerged in both the employee survey and the student survey: a need for 1) more opportunities for active learning, 2) more supportive faculty-student connections, 3) more tutoring resources, and 4) more focus on boosting students' self-confidence. Each theme suggested numerous strategies that could serve as a QEP focus. In June 2020, a diverse cross- college group reviewed the top six most compelling strategies in a research-based forum and selected Embedded Tutoring in High-Challenge Courses as the College's QEP. The topic resonated with the College's long-standing commitment to maximize academic support for students enrolled in high-challenge courses, which are defined as courses with enrollment over 100 and a Productive Grade Rate (PGR) below 70%. PGR is measured as the percent of students who complete a course with a final grade of A, B, or C. Three persistent high-challenge courses were targeted for embedded tutoring intervention: BIOL 2401Anatomy & Physiology I, and co-requisite sections of both College Algebra (MATH 1314+) and Composition I (ENGL 1301+). Co-requisites allow students, who are not yet college-ready, to take credit-bearing courses while also taking developmental education courses to improve their skills. During the three-year QEP project, embedded tutoring will be implemented in 16 sections each semester (8 sections of MATH 1314+, 4 sections of ENGL 1301+, and 4 sections of BIOL 2401). Each summer, embedded tutoring faculty and tutors will prepare for the next academic year by attending a 2-day workshop focusing on best practices in embedded tutoring. Four student learning outcomes were identified for the QEP: 1) demonstrated understanding of course content, 2) increased self-confidence, 3) increased sense of classroom belonging, and 4) positive perceptions of tutoring. These outcomes will be assessed quantitatively through course performance metrics and qualitatively through student survey and focus group data. Faculty and tutors will be surveyed at the end of each term to identify successes and areas for improvement.

Collins, R. (2009). Reflections of a reserved workshop leader. Peer-Led Team Learning: The experience of leading. *Progressions: The Peer-Led Team Learning Project Newsletter, 10*(2). www.pltlis.org/wp-content/uploads/2012/10/Experience-of-Leading-Collins-Reflections-by-a-Reserved-Workshop-Leader.pdf.

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

Conn, J., Close, E. W., & Close, H. G. (2014). *Learning Assistant identity development: Is one semester enough? .* Conference Proceedings of the Physics Education Research Conference, Minneapolis, MN. https://www.per-central.org/items/perc/4046.pdf

The physics department at Texas State University has completed five semesters with a Learning Assistant (LA) program and reform-based instructional changes in our introductory course sequences. We are interested in how participation in the LA program influences LAs' identity both as physics students and as physics teachers; we have previously reported trends in increased community involvement and a shift in experienced LAs' concepts of what it means to be competent. Our interview data now include first-semester LAs, and we see a significant difference in physics identity development between these LAs and those with more experience. LAs near the end of their first semester seem to be experiencing a state of unease with respect to teaching and learning. We explain this discomfort in terms of Piagetian disequilibrium: their conceptions of competence in teaching and learning have been challenged, and they have not yet constructed a new model.

Conner, S. B., & Gray, J. P. (2023). Resisting the deficit model: Embedding wriging center tutors during peer review in writing-intensive courses. *Journal of Responde to Writing, 9*(1), Article 4. https://scholarsarchive.byu.edu/journalrw/vol9/iss1/4.

For many students, peer review can be muddled or frustrating. They can feel uncomfortable with the process if they do not feel confident with their own writing, and many believe poor past performances disqualify them from offering constructive feedback. Because writing center tutors are trained in sharing feedback in a kind and helpful manner, they are positioned to be excellent models for students inexperienced with or damaged by feedback. Learning how to participate in effective peer review can remove the emotional baggage attached to writing and create a respectful community of writers in the classroom. In this teaching tip, we explain how to embed writing center tutors in writing-intensive courses to improve peer review practices.

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

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

Cracolice, M. S., & Brocato, M. (2021). More than content: Training peer leaders in mentorship leadership. *Advances in Peer-Led Learning, 1*(1), 3-11. doi: doi.org/10.54935/apll2021-01-02-03. www.doi.org/10.54935/apll2021-01-02-03.

Training peer leaders to mentor students is an essential component of any peer-led team learning training program. This training method article begins by establishing a definition of mentoring and describing its theoretical underpinnings. Piagetian disequilibrium is one component of why mentoring is effective because interpersonal interaction efficiently assists students in learning how to deal with mental discomfort and grow intellectually from it. A four-part theoretical definition of the components of mentoring serves as the theory base for our training curriculum: (1) psychological and emotional support, (2) goal setting and career paths, (3) academic subject knowledge support, and (4) existence of a role model. In translating theory into practice, we train leaders to follow five key tenets as mentors: (1) be a learning coach, not a tutor, (2) create a trusting environment among your team members, (3) assist students in learning how to learn from feedback, (4) assist students in learning time management skills, and (5) meet with students one-on-one periodically to provide personalized academic and social support. The time commitment to training by a peer

leader is 35 hours per semester via a combination of pre-semester training, in-semester group training, and in-semester one-on-one training. Practical suggestions on how to train leaders are provided.

Cracolice, M. S., & Deming, J. C. (2002). The Sky's the Limit: Learning through PLTL Teams at Big Sky High School. Peer-Led Team Learning: Implementation in high schools. *Progressions: The Peer-Led Team Learning Project Newsletter, 3*(2). www.pltlis.org/wp-content/uploads/2012/10/High-School-Implementation-Cracolice-Deming-The-Skys-the-Limit-Big-Sky-High-School.pdf.

Brett Taylor, a teacher at Big Sky High School in Missoula, Montana, was enthusiastic about his initial experience with a peer-led team learning workshop: "I was apprehensive at first, and as I walked around students kept coming to me for the answers," he said. "I finally had to leave the room to get them to interact with their groups. When I returned, every student was 'on task' and engaged in the subject. In fact, every student stayed engaged for 50 to 60 minutes." He could not believe how effective this method was at encouraging active learning and keeping students interested. High school peer leaders at Big Sky High School also believe that PLTL is an effective learning tool. When asked whether participating in PLTL affected how students solve problems, one leader answered, "PLTL forces them to learn on their own and not have the teacher hold their hand every step of the way. The students must come up with their own answers and work together to figure problems out. The groups helped build student confidence because I didn't have all the answers and so they had to rely on each other for help."

Dennis, S. M. (2013). *Improving student achievement in introductory computer science courses using Peer-Led Team Learning.* (Ph.D. dissertation), Walden University.

There has been a steady decline of majors in the disciplines of science, technology, engineering, and mathematics (STEM majors). In an effort to improve recruitment and retention in STEM majors, an active-learning methodology—peer-led team learning (PLTL)—was implemented by the participating college in the fall of 2005. This methodology was guided by the tenets of learning theory, which holds that new knowledge can be learned in such a way that it can be transferred to other applications through designed learning environments and hands-on projects. The purpose of this quantitative simple experimental study was to examine the impact of PLTL on student achievement in computer science. Students enrolled in CSC 110–Programming I were recruited and the impact of PLTL on their achievement was assessed. PLTL methodology was infused in groups of 6 to 8 students enrolled in CSC 110–Programming I at the participating college. A survey, which addressed the effectiveness of PLTL and how it enhanced critical-thinking skills and academic achievement in students, was administered electronically via SurveyMonkey. Results were analyzed through a 1-sample t test to compare the mean for each research question using a test value of 3 and a confidence interval percentage of 95. According to the study results, there was a significant improvement in academic achievement and critical-thinking skills with the use of PLTL. Based on the survey responses, students' ability to define, analyze, and solve problems improved significantly, as did students' understanding of concepts learned through lessons and course materials. This study may lead to positive social change by informing educators about the implementation of alternative learning styles, such as PLTL, which can lead to increased numbers of students who major and graduate in the STEM majors.

Donelan, M., & Kay, P. (1998). Supplemental Instruction: Students helping students' learning at University College London (UCL) and University of Central Lancashire (UCLAN). *The International Journal of Legal Education, 32*(3), 287-299.

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

Donelan, M., & Wallace, J. (1997). *Peer assisted learning: A truly co-operative initiative*. Unpublished manuscript. University College London. London, England.

This paper sets out to examine the place of peer assisted learning within the contest of higher education i the United Kingdom and to see how one model of co-operative peer learning, Supplemental Instruction, supports academic teaching, enhances the students' learning experience, reduces attrition, and most important of all in this context enables the students to develop confidence with the subject and practical development of those generic personal qualities and attributes most keenly sought by graduate employers: communication, teamwork, problem solving, negotiation, decision making, and management of self and others.

Drake, R. G. (2011). Why should faculty be involved in Supplemental Instruction? *College Teaching, 59*(4), 135-141.

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

Dreyfuss, A. E., & Fraiman, A. (2015). *Peer-Led Team Learning: An active learning method for the 21st century.* Conference Proceedings of the 8th International Conference of Education, Research and Innovation, Seville, Spain.
www.academia.edu/27249011/PEER-LED_TEAM_LEARNING_AN_ACTIVE_LEARNING_METHOD_FOR_THE_21_ST_CENTURY?email_work_card=view-paper

Peer-Led Team Learning (PLTL) is a strategy to further education reform and improvement. PLTL increases retention in courses in the sciences, mathematics, and engineering, as well as in other disciplines; improves the learning process and prepares students to work in teams, and creates outstanding student leaders. PLTL engages an experienced and trained student as the overseer of a small group of learners in the capacity of Vygotsky's "more capable peer." PLTL has been recognized as a strategy to help students emulate the peer leaders as role models, to reduce student anxiety and build confidence in the learners. PLTL builds strong study skills, develops such critical workplace skills as working in teams, listening, critical thinking, leadership development, and fosters communities of learners who approach learning as a way of life. The peer leaders, generally undergraduate students who are trained for this role, understand the challenges that students have with the material; in a new initiative peer leaders are creating and developing workshop material in conjunction with faculty, augmenting their metacognition. PLTL is an internationally recognized curriculum enhancement strategy adopted at over 150 universities and colleges across the United States, and in the United Kingdom and Jamaica, West Indies. Initially started as Chemistry Workshop, PLTL is coordinated by the Peer-Led Team-Learning International Society (www.pltlis.org). This paper will present the basics of the PLTL instructional model and the practicalities of the six critical components which distinguish the model: integration of the workshop component into the course structure, involvement of the teaching faculty, training and supervision of the peer leaders, creation of challenging materials, and provision of appropriate institutional resources. In addition, the paper will present the results of assessment conducted on student performance and experiences with the PLTL program. Published PLTL data over the past 20 years have shown that using successful peer leaders in small group workshops boost performance in critical first-year courses including core math, science and engineering courses.

Dunbar, J., & O'Connor, J. (2016). Why early engagement in college research is important: Lessons learned at Wayne State University *The power and promise of early research* (pp. 185-193): American Chemical Association

Undergraduate students that attend Wayne State University typically have excellent high school academic records and many begin their first year of college with goals of a career in academic disciplines. However, many exceptionally talented and high-achieving students, particularly students from disadvantaged backgrounds, first-generation college and/or under-represented minority (URM) students, often lack a complete package of the academic tools, persistence, confidence and developmental mentoring necessary to persist effectively in a college environment. Many of these students are left behind or inadvertently allowed to drift and become emotionally disengaged in the university. These factors often can result in students dropping out, changing majors or losing focus resulting in them pursuing "convenient" career options when they otherwise could have been successful if an appropriate focus and support structure had been in place to build their skills and develop their ambition. In this chapter, we will describe, analyze and provide some conclusions on our experience in the early engagement of students in research and its impact on their career outcomes.

Dyett, J. M. (2010). *Determining physical therapy students' perceptions about faculty-led Supplemental Instruction at a selected community college.* (Ph.D. dissertation), Capella University, Minneapolis, MN.

The purpose of this research study was to examine the perceptions of students in faculty-led supplemental

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

Eastmond, J. N., 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.

Eaton, M. D. (2015). Bridging the experiential learning gap: An evaluation of the impacts of Ulster University's Senior Student Tutoring Scheme on first year students. *Journal of University Teaching & Learning Practice, 12*(2), article 6. www.ro.uow.edu.au/jutlp/vol12/iss2/6/.

Since 2004-05 first year students at the School of Environmental Sciences, Ulster University have engaged with senior student tutors (SSTs) in workshop activities aimed at preparations for their written examinations. Using a pedagogical action research methodology we evaluated the role of SSTs in bridging the experiential learning gap between practitioners and recipients. Analysis suggested positive associations between workshop participation, examination success and improved module marks. Surveys showed that first year students gained confidence, were less intimidated and empowered with revision and examination techniques. The SSTs gained valuable insights, tutoring experience and an evidence base useful to their career paths. Discussion focused upon risk-averse first year students who grasped and then transformed the experiences of the SSTs into successful examination performance. It is argued that our SSTs have helped to bridge the experiential learning gap and made inter-collegiate connections that would have been less-likely in a formal, teaching staff-led situation. Faculty suffering from examination related student progression problems could, therefore, benefit from adopting this locally controlled, low cost, small-scale, tailor-made, peer assisted tutoring scheme.

Ediger, K.-A. (2007). *Peer Assisted Learning sessions: Building a community of learning and achievement*. Unpublished manuscript. Department of Postsecondary Teaching and Learning, University of Minnesota. Minneapolis, MN.

This study examined the first two years of the Peer Assisted Learning (PAL) program developed at the University of Minnesota. The PAL program is based on several national peer learning programs including Supplemental Instruction, Peer-led Team Learning, and the Emerging Scholars Program. The evaluation revealed benefits

for both the PAL participants and the facilitators. Some of the PAL courses examined had a mandatory attendance policy and others were available to enrollees who attended voluntarily. For PAL courses where attendance was mandatory, a student was deemed a nonparticipant if they failed to attend at least half of the PAL sessions during the academic term. Both a quantitative and qualitative study was conducted. The quantitative study revealed statistical significance for the PAL participants at the p <.05 or lower for earning a higher percentage of A grades and lower rates of C, D, F, and course withdrawal as compared with PAL nonparticipants. The qualitative study of the PAL facilitators identified five outcome themes in their own experience in the PAL program (a) enhanced personal learning and study skills, (b) increased group facilitation and decision making skills, (c) increased confidence and enjoyment during learning, (d) positive relationships with participating students, and (e) sense of community in helping others grow and learn. The PAL facilitators also perceived changes among their PAL participants (a) increased analytical skills; (b) increased confidence and risk taking behaviors; (c) increased importance and effectiveness of working in small groups; (d) increased comfort when engaging and sharing ideas with other students; and (e) increased academic autonomy, diversity of study strategies, and self-reliance. The Peer Assisted Learning (PAL) program at the University of Minnesota is a primary academic support program for historically difficult, introductory college courses that serve as gatekeepers to academic degree programs. Based upon operating principles of other programs and educational theories, PAL is integrated into the courses it serves.

Fleet, T. (2017). *The relationship of locus of control and social learning on academic achievement in a Supplemental Instruction program.* (Ph.D. dissertation), Abilene Christian University, Abilene, TX. www.digitalcommons.acu.edu/cgi/viewcontent.cgi?article=1055&context=etd

A large number of high school students entering college are arriving academically unprepared. Abilene Christian University's newly founded Bridge Scholars Program seeks to help and support academically at-risk students based upon low ACT/SAT scores and low high school GPA averages. This research utilizes the Supplemental Instruction program, (based upon Bandura's social learning theory), as its academic intervention. The research questions are 1) How does Supplemental Instruction contribute to an at-risk student's college readiness (knowledge, skills, attitudes, behaviors and strategies)? And, 2) Does a student's internal or external locus of control predict academic performance? A pretest and posttest using Rotter's (1966) Internal-External Locus of Control Scale measured students' overall academic confidence. Class test scores, class final grades, and semester GPA were used to measure Supplemental Instruction program effectiveness. Although Locus of Control proved insignificant, test scores, final class grade, and overall semester GPA indicate that the Bridge Scholars program and Supplemental Instruction are highly effective interventions in better preparing at-risk students for the rigors of college level academia.

Ford, N., Thackeray, C., Barnes, P., & Hendricks, K. (2015). Peer learning leaders: Developing employability through facilitating the learning of others. *Journal of Learning Development in Higher Education, November*. www.aldinhe.ac.uk/ojs/index.php?journal=jldhe&page=article&op=view&path[]=373.

Employability is a key theme in higher education and attitudes towards its development have shifted from a focus on technical skills development to a broader focus on values, intellect, social engagement and performance contributing to graduate identity (Hager and Hodkinson, 2009). Peer Assisted Learning (PAL) and Language Conversation Clubs are both examples of student-led peer learning schemes at Bournemouth University (BU), and are reviewed to explore the development of students employed to lead and facilitate group learning sessions. Data from four annual evaluation surveys (n=239) is reviewed in addition to qualitative comments and reflective writing. Peer leaders were found to have developed employability attributes including: leadership, time management and organisation, communication, and cultural awareness. Above all, peer leaders identified with developing confidence in their roles. Comments provided examples of student leaders who had actively selected peer learning as an opportunity to develop their confidence and were able to transfer this to other academic and employment contexts.

Gafney, L., & Varma-Nelson, P. (2007). Evaluating Peer-Led Team Learning: A study of long-term effects on former workshop peer leaders. *Journal of Chemical Education, 84*(3), 535-539. www.pubs.acs.org/doi/pdf/10.1021/ed084p535.

This article describes a study that examined the impact of the Peer-led team learning (PLTL) program with the student facilitators who had direct contact with the students. With a decade of data available on 600 student leaders from 9 institutions, the PLTL facilitators were studied as they took subsequent steps into graduate work and careers. A survey was developed, piloted, revised, and placed online. There were 119 leaders who completed the survey. Respondents reported that leading the workshops reinforced the breadth and depth of their own learning, helped them develop personal qualities such as confidence and perseverance, and fostered a variety of presentation and team-related skills. The respondents offered rich insights into issues in implementing workshops.

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.

Garland, M., & Gordy, K. (1987). *Supplemental Instruction in the context of critical thinking*. Unpublished manuscript. The University of Missouri-Kansas City. Kansas City, MO.

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

Ghio, C., Morris, S. A., Boyce, H. M., Priem, B. J., DiMilla, P. A., & Reisberg, R. (2020). *The impacts on peer tutors of learning group Supplemental Instrucdtion for first-year engineering students.* Conference Proceedings of the ASEE. www.peer.asee.org/35336.pdf

The purpose of this study was to investigate the impact of peer tutoring experiences on upperclass male and female tutors who provided Supplemental Instruction (SI) for first-year engineering students enrolled in required general chemistry and physics courses at Northeastern University. Our previous research has shown a correlation between regular use of SI by first-year engineering students and increased GPA, as well as gender-based differences in SI usage and effects of SI. In this study, we turned our focus to the effects of the tutoring role on the tutors and sought to elucidate 1) whether tutors perceived that they benefitted from the SI experience, and if so, in what ways, 2) how gender affected attitudes towards tutoring and the impact of serving as a peer educator, and 3) whether level of commitment to group SI correlated with tutors' perceptions of how they were impacted. Forty-one individuals who served as peer tutors at Northeastern University between 2005 and 2018 were invited to respond to online surveys. Those who completed the online survey were invited to participate in follow-up phone interviews. Subjects were asked about their experiences with SI, their motivations to provide instruction, their level of commitment to the program, and—as they reflected on their college and post-graduation endeavors—their perceptions of the value of their tutoring experience. Statistical comparisons were drawn from the responses of 20 female and 9 male tutors to the online survey, and qualitative analysis of transcripts of follow-up phone interviews with 13 women and 4 men were performed. Through the application of grounded theory to transcripts, supported by statistical analysis of data from the online survey, it was deduced that increased confidence and preparedness in future endeavors was the core category that linked individuals' tutoring experiences. Participants reported that relationships developed with tutees, fellow tutors, and faculty mentors during their tutoring experiences impacted them beyond their experiences as tutors. Participants reported improved soft skills, including communication, teamwork, and leadership, and strengthened academic abilities, which resulted from a deeper understanding of the tutored subject matter. Serving as tutors also caused tutors to be more open to receiving tutoring themselves in their coursework. Improvement in soft skills along with enhanced academic ability contributed to an increased sense of confidence and preparedness. Analysis of the role of gender showed that females were more likely than males to perceive an increase in self-confidence and to view themselves as confidence builders for tutees. Women were also more likely than

men to become a tutor to improve their communication skills and help others. Years spent as a tutor correlated positively with greater perceived benefits for both genders. This study demonstrates that peer tutoring can have a significant impact on the academic performance and professional development of tutors, particularly females, in addition to tutees.

Gill, D., Parker, C., Spooner, M., Thomas, M., Ambrose, K., & Richardson, J. (2006). Tomorrow's doctors and nurses: Peer assisted learning. *The Clinical Teacher, 3*(1), 13-18. www.theclinicalteacher.com.

This article describes the use of Peer Assisted Learning (PAL) in the United Kingdom to improve achievement for health science students at the Royal Free and University College London Medial School and the School of Health and Social Sciences at Middlesex University. PAL is based upon the Supplemental Instruction (SI) model. Senior nurses served as the PAL leaders for the first-year students. Outcomes for the PAL leaders included gains in confidence, knowledge of the subject material, gains in teaching and clinical examination skills, and an opportunity to enhance interprofessional relationships.

Gill, M., & McConnell, C. (2016). “What’s in it for me?” - An investigation into the motivations, challenges and benefits of peer leadership in a School of Education. *Student Engagement and Experience Journal, 5*(1). doi: 10.7190/seej.v4i1.117. www.research.shu.ac.uk/SEEJ/index.php/seej/article/view/117/pdf.

This case study of practice provides an account of an academic peer-learning scheme in a university School of Education in the South of England. The significance of this case study is to provide insights specifically into the experiences of undergraduate peer leaders. The scheme is called PASS (Peer Assisted Study Sessions), and is a nationally recognized student-led mentoring scheme involving trained student volunteers from levels five and six (second and third year) facilitating weekly study sessions for level four (first year) students. Through the voices of seven student PASS leaders, this small-scale study employed a qualitative approach using a focus group to explore leaders’ motivations, and to enable a discussion of the benefits and challenges they experience through leadership. The findings also reveal the leaders’ awareness of their growing confidence, communication and employability skills development, particularly pertinent for Education students in relation to their future career paths in teaching and learning settings.

Ginns, I. S., & Watters, J. J. (1995). *Final Report of Peer Assisted Study Sessions in Science Foundations MDB303*. Unpublished manuscript. Queensland University of Technology. Brisbane, Queensland, Australia.

This report describes the use of Peer Assisted Study Sessions (PASS) with students at Queensland University of Technology (Brisbane, Queensland, Australia). PASS is the term used at the institution for Supplemental Instruction (SI). Students enrolled in the Primary and Early Childhood strands of the preservice Bachelor of Education program are required to undertake basic studies of science in their first year. This core unit (Science Foundations - MDB303) was the course proposed for PASS. The performance of the students were examined on a 1 to 7 scale (1 to 3=fail, 4=pass, 5=credit, 6=distinction, 7=high distinction). The PASS group earned a statistically significant ($p < .01$) higher mean final course grade of 4.88 as compared with 4.15 for the non-participants. No PASS participants earned a failing grade while 8 of the non-participants did so. The PASS group earned grades of distinction or high distinction 66 percent of the time compared with 28 percent for the non-participants. Interviews with PASS participants identified the following changes: more thorough understanding of scientific concepts; identified ways of engaging the course content; study methods improved; established more consistent study times; attitudes towards science improved; and overall confidence increased. PASS leaders mentioned the following changes for themselves: increased confidence in teaching skills; enjoyed working in groups.

Gold, C. (2019). *Transformative learning gains in undergraduate Learning Assistants.* (Honors project), Bowling Green State University. https://scholarworks.bgsu.edu/cgi/viewcontent.cgi?article=1574&context=honorsprojects

The Learning Assistant (LA) program is utilized at Bowling Green State University (BGSU) to assist in shifting classrooms from lecture based to more interactive and groupwork based learning. LAs are employed in courses with greater than 80 students enrolled that have historically high drop, withdrawal, and failure rates. Not only are students in courses with LAs having positive experiences, but the LAs themselves are as well. Interest has grown in the development of LAs during their time in the program; this can be measured in the form of transformation. Transformative learning is defined as “learning that results in transformative changes which alter the student in a significant way, changing the state of the learner” (Springfield et al., 2015). Through their time in the program LAs have been studied through the use of survey answers, using a coding rubric developed by Springfield et al., to determine their levels of transformative learning. Involvement in the LA program has been shown to transform LAs in four categories, confidence, skills, perspective, and identity. Data has shown that a large majority of LAs experience high levels of transformative learning gains in all four categories. One way this transformation is extremely beneficial to LAs may be that they have a stronger identity within their STEM field (Close, 2016). Factors influencing this transformation in LAs is

investigated, with the impact of different approaches to LA training being a focus.

Grillo, M. C., & Leist, C. (2014). Academic support as a predictor of retention to graduation: new insights on the role of tutoring, learning assistance, and Supplemental Instruction. *Journal of College Student Retention: Research, Theory and Practice, 15*(3), 387-408.

This study examined the relationship between the long-term use of academic support services such as tutoring, learning assistance, and Supplemental Instruction and retention to graduation. Little research has been devoted to the relationship between academic support and retention to graduation in both the literatures on retention and academic support. The authors use 6 years of data from the University of Louisville's Resources for Academic Achievement unit (REACH) to test the hypotheses that a larger quantity of time spent engaged in academic support services is associated with a higher likelihood of graduation and that cumulative GPA mediates the relationship between hours spent using academic support and graduation. The findings support these hypotheses, suggesting a relationship between academic support and retention to graduation that should be given serious consideration by scholars and administrators. Students' active engagement in academically focused sessions with their peers serving as tutors, LA and SI leaders may have provided multiple benefits. For example, not only did these interactions help students understand or clarify difficult concepts in a content course, but additionally, these interactions may have improved the motivation to learn, the understanding of the process of learning, and the development of study strategies. Each of these factors could be future avenues of additional research focused on the relationship of academic support and retention. Regardless of which benefit may have most assisted students who used academic support services, this engagement outside of the classroom seems to have contributed to their academic or social integration to the extent that these students were more successful in their courses as evidenced by earned GPA which then contributed to their retention at the university. The results of this study suggest that the positive impact of this engagement with academic support services was long-term and associated with graduation. This study also found the quantity of hours spent in academic support was related to students' mean GPA, where more tutoring hours led to higher GPAs which then led to a higher likelihood of graduating. This evidence supports the pragmatic advice frequently given by academic support professionals who emphasize, especially to first-year students, the benefits of engaging in academic support services early and often during the semester. Higher GPA has been associated with college graduation in previous research studies and is commonly acknowledged (Harackiewicz, Barron, Tauer, & Elliot, 2002; Ishitani, 2003). The data analysis for this study offers additional evidence for this claim. The higher students' earned GPA, the more likely the students were to graduate. As mean GPA increased, the likelihood of graduating increased. For this study, students who maintained higher GPAs engaging in academic support services may have improved their confidence in their own ability to learn or contributed to developing a sense of empowerment or self-efficacy necessary for college success. A last finding of this study suggests that traditional predictors of college readiness (high school GPA and standardized test scores, e.g., ACT or SAT scores) did not have a statistically significant relationship to the likelihood of students' graduating. This finding supports other retention research which suggests the complexity of identifying the components necessary to predict college success beyond those academic skills measured by high school grades and standardized test scores at the time of admission (Geiser & Santelices, 2007; Pascarella et al., 2006).

Guzman, J., Becvar, J. E., & Saupe, G. (2012). *Workshop adaptability.* Conference Proceedings of the Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. www.pltlis.org/wp-content/uploads/2012%20Proceedings/Guzman-2012.docx

How often would a student in a course walk up to a professor and say: "Professor, I do not comprehend the material; would you mind changing your teaching style?" More than likely one would never see this scenario. Students generally are forced to adapt to their professor, not the other way around. At the University of Texas at El Paso the Peer-Led Team Learning program provides the ability to tailor a classroom to the students' needs. The peer leader directs students into self-learning using team-based activities and problem solving strategies. One advantage of this program is its ability to evolve to students' needs. The small classroom environment promotes a personal connection among peers. This personal connection allows students to feel comfortable to ask questions and even more important, to make suggestions. The format allows students to reflect on the activities for the day to make recommendations for following workshops and for improvements giving students a sense of ownership of their learning process. The relaxed learning environment focuses attention on learning the concepts at hand not the shortcomings of the professor.

Hakizimana, S., & Jurgens, A. (2013). The Peer Teaching/Learning Experience Programme: An analysis of students' feedback. *Alternation Special Edition 9*, 99-127.

Freire's views on the dialectical nature of teaching and learning inspired a group of postgraduate students who had previously been involved in facilitating Supplemental Instruction (SI) but observed low student participation. After reflecting on their own experiences the group initiated a discussion forum for first year biology students

with the aim of transforming student learning from a relatively passive experience to an active, engaging process. In contrast to the SI programme Peer Teaching/Learning Experience Programme (PTLEP) sessions were characterized by large student numbers per session (100 to 300), a much longer duration (up to 3 hours), and they were conducted at weekends or after hours. Furthermore sessions were offered only close to exams and tests with two sessions per test and three sessions per exam. In the PTLEP tutorials, facilitators guide the process and make comments, but only after the students themselves have made suggestions on how to answer questions correctly. Records from the attendance registers, evaluation questionnaires given to a sample of students attending the programme, and video recordings of sessions revealed that PTLEP increased attendance and active participation of the attending students. These multi-layered peer interactions mitigated the effects of the high student-lecturer ratios observed at the University of KwaZulu-Natal and offered pedagogical benefits as competition was decreased among students and cooperation, motivation, self-confidence and self-esteem were increased. Contrary to the belief that peer teaching should be limited to peer discussion in small groups, the s students' responses to a set of questionnaires and their participation in academic workshops indicate that, in an African context, peer education involving large numbers of students creates a motivating learning environment

Halbedel, S. A. (2022). *Impact of Supplemental Instruction on student performance in high-enrollment social science courses: An exploratory case study.* (Ph.D. dissertation), La Jolla, CA. https://www.proquest.com/docview/2648147940/fulltextPDF/A21AA320A0464DFDPQ/1?accountid=14586

Large class sizes can be a barrier to seeking assistance, inhibiting student success. Efforts to improve student outcomes and address the reluctance of students to access academic resources lead many institutional leaders to turn to unique academic support initiatives, like Supplemental Instruction (SI). There is ample evidence that Supplemental Instruction improves student success. However, there is limited research on the effects of SI in high-enrollment courses. Framed through the lens of social constructivist theory, the purpose of this qualitative exploratory case study was to (a) examine the impact of supplemental instruction on the course performance of students enrolled in several high-enrollment introductory social science courses; (b) discover how SI attendance impacted course outcomes, and; (c) explore what components of SI participants perceive as beneficial and how they perceive those benefits impacted their course outcomes. An analysis of archival academic data showed that students who participated in SI had higher mean course grades, lower probation rates, and lower course failure rates. Moreover, this study provided evidence that the frequency of attendance also helps to improve course performance. A comparison of students who attended the most versus those who attended the least showed the greatest improvement. Additionally, data from semi-structured interviews revealed that SI could help students navigate high-enrollment courses by fostering a smaller learning environment. Students felt SI sessions allowed for more personal interactions with SI leaders and their peers. Moreover, students indicated they felt an increased sense of confidence and empowerment. Key recommendations for practice include piloting SI programs for traditionally difficult courses with high drop-fail-withdraw (DFW) rates, designing robust programs that emphasize collaboration amongst program staff, faculty, and students, and using SI as an academic support resource in high-enrollment courses. Recommendations for future research include designing a more robust qualitative study with a larger interview sample and designing a multivariate analysis to control for student characteristics that might affect course grades and lead to differences in the likelihood of taking advantage of the SI program.

Hallman, R. (2014). Re-envisioning course-embedded programs at the graduate level: A tutor's experience in a doctoral, translingual marketing course. *Praxis: A Writing Center Journal, 12*(1), 57-62. https://repositories.lib.utexas.edu/bitstream/handle/2152/62318/Hallman_12.1CourseEmbeddedWritingSupportPrograms-10.pdf?sequence=2&isAllowed=y.

We were halfway through our Summer 2014, PhD-level, required University of Houston,2 Bauer College of Business class, MARK 8397: Communicating Academic Research, when Carol,3 a five-foot tall, thick-skinned, straight-shooting, endowed chair and Marketing professor explained my role in her course as "hand holding." I raised my eyebrow and waited for her to continue. "You know, confidence building," she continued. I felt slightly better. Then she said, "Academic writing is confusing for students because they don't know which way to go. They might know when and why they need to make changes, but they don't really know how to do it." This was better. Carol's idea of me as a guide for students through the "how" of academic writing was something I felt matched my own understanding of my role in the course.

Hannum, D., Bracewell, J., & Head, K. (2014). Shifting the center: Piloting embedded tutoring models to support multimodal communication across the disciplines. *Praxis: A Writing Center Journal, 12*(1), 96-101. doi: https://doi.org/10.15781/T2CC0V914.

Beginning in its third year, the Georgia Tech Communication Center began investigating embedded tutoring as part of the overall slate of tutoring services already in practice. Because our center remains in a nascent period of

identity, we continue to enjoy an unusual amount of flexibility in how we are exploring new ways to work within the tutoring milieu—that is, we have not had time to become complacent in providing services in particular ways. Additionally, because we are somewhat unusual given our professional staff of postdoctoral fellows, we have a broader ability to work across disciplines with instructors who are more willing to work with postdocs than with undergraduate peer tutors. Our aim is to build embedded tutoring programs with our postdocs, gain the confidence of faculty members across campus, and, eventually, begin embedding peertutors in classes.

Hayes, C., & Fulton, J. A. (2019). A participatory action research study on the impact of Peer Assisted Student Support (PASS) and Supplemental Instruction (SI) by international PhD students. *Journal of Learning Development in Higher Education*(14). www.journal.aldinhe.ac.uk/index.php/jldhe/article/view/477.

Using a Participatory Action Research (PAR) approach, this evaluative research study gives an insight into the implementation of a pilot study of a newly implemented Peer Assisted Student Support (PASS) and Supplemental Instruction (SI) Programme. The focus of the study involved six postgraduate PhD students delivering a PASS/SI scheme to cohorts of MSc Public Health, MSc Nursing and MSc Psychosis and Complex Mental Health Interventions students, all undertaking their final dissertations. The study was used to illuminate the degree to which PASS and SI were perceived to impact on the overall student experience as part of a quality enhancement initiative. Findings of the study revealed that the programme had positively impacted on both PASS/SI leaders and participants of the scheme, who reported increased confidence and an increased sense of social inclusion and belonging to the institution respectively. Being facilitated by students who had experienced the same academic pathway was perceived to have widened networking opportunities and to have positively impacted on the capacity of the participants and leaders to build relationships and prepare skills of direct relevance to the requirements of an employer such as teamwork and initiative.

Hibbert, T. D. (1996). *Taking study skills to the classroom: Supplemental Instruction as an integral part of college courses.* (Master's of Arts thesis), University of Texas at El Paso, El Paso, TX.

This paper studied the impact of Supplemental Instruction (SI) at the University of Texas at El Paso during Fall 1994 and 1995 in three Sociology Statistics classes and three Sociology Methods of Research classes with a total student enrollment of 269 students. These sections were chosen since the same instructor taught the three sections in each subject -- controlling for the possibility of different teaching styles. The three dependent variables studied were final course grade, semester grade point average, and re-enrollment at the university the following academic term. The classes included in this study had D, F or withdrawal rates of 32 to 38 percent before providing the SI program. During Fall 1994 the researcher conducted a mandatory study session connected with each section of the sociology classes. These mandatory sessions occurred during one class period each week. In one course section the researcher conducted a traditional SI session. In the other section of the same course the researcher allowed the enrolled students to guide the session. The researcher served as a discussion facilitator. The results were mixed regarding the improvement of semester grade point averages. In the statistics course the SI group had a higher subsequent semester GPA (2.86 vs. 2.57). In the methods course the results slightly favored the non-SI group (1.98 vs. 1.90). The same pattern emerged regarding final course grades. In the statistics course the SI group had higher academic performance (percent A & B, 41.3% vs. 32.6%; D, F & W, 32.0% vs. 30.4%; mean final grade, 73.66 vs. 72.2). In the methods class the non-SI group had higher achievement (percent A & B, 55.0% vs. 48.9%; D, F, & W, 20.0% vs. 26.5%; mean final grade, 76.4 vs. 73.8). An abbreviated version of the Whimbey Analytical Skills Inventory (8 items rather than 38) and a math assessment test was administered to all students at the beginning and the end of the academic term. No significant differences were found. Analysis of student journals suggested increased confidence and enjoyment of the course content due to the experience of the supplemental study review sessions provided through both the traditional SI and the informal student-led sessions. The researcher postulated several possible reasons for no significant difference between the SI group and the informal student study groups: (1) since the same person facilitated the SI sessions and the informal student study group (non-SI) some SI activities may have been utilized during the non-SI group sessions; (2) the SI facilitator also provided additional tutorial help to the non-SI group throughout the academic term.

Hill, S., Gay, B., & Topping, K. J. (1998). Peer-assisted learning beyond school. In K. Topping & S. Ehly (Eds.), *Peer-assisted learning* (pp. 291-311). London: Lawrence Erlbaum Associates, Publishers

This book chapter provides a wide overview of peer-assisted learning (PAL) programs. The first part deals with cross-age tutoring programs. This most often involve college students working with young people. It is common for student tutors to report growth in improved communication skills, self-confidence, and cognitive gains. The studies have had mixed results concerning cognitive gains by the tutees. More common improvements are reported with the social and affective domains. The authors report substantial and

persuasive evidence of impact on dropout rates, course grades, and graduation outcomes.

Hoffman, M. Z., & Crosby, A. D. (2004). *Assessing Peer-led Team Learning in honors-level general chemistry.* Conference Proceedings of the 228th American Chemical Society National Meeting, Philadelphia, PA. For more information, contact the authors at the Department of Chemistry, Boston University, 590 Commonwealth Avenue, Boston, MA 02215, hoffman@chem.bu.edu

Peer-led Team Learning (PLTL) was used in an honors college at Boston University. Students provided feedback about PLTL through frequent survey forms and writing assignments. Students reported that the PLTL peer facilitators were more effective than traditional graduate assistants in learning the chemistry content material. Additional reported benefits included higher self-confidence and deeper understanding of the role of a teacher.

Holmer, A. (2017). Quantifying the soft power of SI. *Supplemental Instruction Journal, 3*(1), 80-93. www.info.umkc.edu/si/wp-content/uploads/2017/12/Compressed-siJ-Volume-Three-Issue-One.pdf.

Supplemental Instruction is one of the most successful programmes of peer-assisted study in existence. Numerous studies show that SI attendance correlates with student achievement, regardless of the level of knowledge of the student prior to commencing their studies. The present study, from Humanities at Lund University, Sweden, outlines a method for gauging the effect of SI on soft values such as study attitudes, confidence, and self-reported study skills. To eliminate the effect of different backgrounds, the study is based on 388 pairs of two questionnaires (before and after the semester) and SI attendance is correlated with the change in the self-reported values, rather than with the final absolute value. It is shown that issues dealing with study skills and strategies correlate more closely with SI-attendance than do psychological issues such as ambition and confidence.

Hull, H., Broome, H., Brown, D., & Portlock, J. (2017). A quantitative survey of the MPharm peer assisted learning programme at the University of Portsmouth. *International Journal of Pharmacy Practice, 23*, 59. www.pharmacyresearchuk.org/wp-content/uploads/2017/04/73-A-quantitative-survey-of-the-MPharm-peer-assisted-learning-programme-at-the-University-of-Portsmouth.pdf.

Peer assisted learning (PAL) involves Year 2 student volunteers called PAL leaders, trained in leadership and facilitation skills, who run study sessions for Year 1 students. PAL was developed to aid transition into university for Year 1 pharmacy students and the course. PAL leaders were Year 2 pharmacy students. The aim of this study was to determine the perceived impact of peer assisted learning (PAL) upon Year 1 MPharm undergraduates' transition to university and their perceived preparedness for assessment. Eight PAL sessions were timetabled during the academic year and two PAL leaders facilitated 20 pharmacy students. Topics were student-led, meaning Year 1 students had control of the subjects to study and discuss in sessions. PAL leaders encouraged collaborative learning and consolidation of knowledge between students. Feedback from 182 pharmacy students, collected by means of a questionnaire, indicated that those students attending more than 4 PAL sessions (good attenders) during the academic year, benefited more than those attending fewer sessions (poor attenders). Students perceived an "enhanced knowledge and understanding of course topics" (60% good attenders compared to 34% poor attenders); "better understanding of how to meet course expectations" (51% compared to 22%) and an overall "confidence with the course" (42% compared to 11%). Attending PAL increased students' perceived "preparedness for assessments" (86% compared to 59%). Students found PAL sessions useful and regular attendance impacts upon pharmacy students' perceived knowledge, understanding and confidence with their course. As PAL becomes embedded into institutions' cultures and the benefits further evidenced by impact-evaluation research, it should become a valued priority for resourcing.

Hurley, M., & Gilbert, M. (2008). Research on the effectiveness of Supplemental Instruction. In M. E. Stone & G. Jacobs (Eds.), *Supplemental Instruction: Improving first-year student success in high-risk courses* (Monograph No. 7, 3rd ed., pp. 11-19). Columbia, SC: University of South Carolina, National Resource Center for the First-Year Experience & Students in Transition

This chapter explores some of the research studies that evaluate the effectiveness of Supplemental Instruction (SI). The cited studies are those conducted by the staff at the University of Missouri-Kansas City, institutions at other U.S. institutions, and institutions outside of the U.S. Some of the cited studies focused on immediate outcomes of the SI program regarding improved final course grades and reduction of course withdrawals. Other studies examined longer-term impacts regarding increased persistence towards graduation. Other studies investigated changes in student affective domain such as self-confidence, personal communication skills, and other areas. Regardless of institutional type, academic discipline, or student population, participation with SI increased student outcomes.

Hurley, M. A. (2000). Video-based Supplemental Instruction (VSI): An interactive delivery system that facilitates

student learning [Ph.D. dissertation, University of Missouri-Kansas City, 1999]. *Dissertation Abstracts International, 61*(04), 1317.

The study focuses on the cognitive and affective results of a small-group learning model called Video-based Supplemental Instruction. There are two hypotheses examined in this study: Students who participate in a Video-based Supplemental Instruction history class will have higher final course grades than a comparable group of students in the same course in a lecture-format class with the same professor. Students who participate in the Video-based Supplemental Instruction class will have greater self-efficacy, self-confidence and mastery of learning strategies than they had before taking the class. Video-based Supplemental Instruction is an interactive informational delivery system that helps students master course content as they develop and refine reasoning and learning skills. Instructors record their lectures on video tape and enroll students in a video section of the course. A trained facilitator uses the taped lectures to regulate the flow of information to the learner. The lectures are stopped and started as needed, allowing the facilitator to verify that students have comprehended one idea before moving on to the next. Students develop essential reading, learning, and study skills while they master content. The major conclusions from the study were the following: A group of 185 Video-based Supplemental Instruction students received a higher percentage of A's and B's than a comparable group of 185 Non-Video-based Supplemental Instruction students in the same history class over 14 semesters. A group of 185 Video-based Supplemental students received a lower percentage of D's and F's than a comparable group of 185 Non-Video-based Supplemental Instruction students in the same history class over 14 semesters. A larger number of first-year students and African-American students were enrolled in the Video-based Supplemental Instruction history class than was expected. Video-based Supplemental Instruction students learned a variety of strategies which provided them with the academic tools to be successful on their history exams in that class. Video-based Supplemental Instruction students developed a greater sense of self-efficacy in the class. Students developed greater personal confidence because of the Video-based Supplemental Instruction experience. Some Video-based Supplemental Instruction students were unable to sufficiently articulate mastery of course concepts after completing the class.

Jarvi, S. W. (1998). A quantitative and qualitative examination of Supplemental Instruction and its relationship to student performance (collaborative learning, academic support) [Dissertation, The University of Connecticut, 1998]. *Dissertation Abstracts International, 59*(05), 1484A.

Academic support programs are well entrenched on virtually every college campus. These programs have not always been warmly received, however, and their place on many campuses is a source of constant debate. They have to be evaluated effectively and often to determine if they are achieving their intended goals and contributing to the overall mission of the institution. Supplemental Instruction (SI) is one example of a support program because it utilizes peers to foster a collaborative learning environment and targets high risk classes as opposed to high risk students. Quantitative and qualitative methodologies were employed in this study. The sample for the quantitative component included 2,295 cases of a student completing 1 of 12 introductory level Biology or Chemistry courses in which SI was offered at a large New England Research University. From the total sample, 860 students attended at least one SI session. Qualitative techniques were employed to collect data from both participants and non-participants of SI during one semester. Direct regression where the independent variables of Scholastic Aptitude Test scores, cumulative grade point average, semester standing, and level of SI participation. The dependent variable was student performance in the class as measured by average exam scores. Analyses of data found that in 7 of 12 classes involved, level of participation in SI explained a significant additional amount of variation in exam scores with accompanying large effect sizes. Qualitative findings revealed core categories related to why students attend SI: belief that SI attendance helps to raise test scores; SI sessions were fun and made participants feel more comfortable; students liked SI since it gave an opportunity to work in teams with other students; enabled attendees to stay academically competitive; and sometimes SI sessions compensated for poor lectures. The two major reasons for students not participating in SI were that time constraints precluded attendance and the other reason was a belief that SI attendance was unnecessary.

Johnson, E. C., & Loui, M. C. (2009). *How can students benefit as peer leader of learning teams?* Paper presented at the 39th ASEE/IEEE Frontiers in Education Conference, San Antonio, Texas.

In a course for freshmen in electrical and computer engineering, students may choose to attend optional supervised study sessions, which implement Peer-Led Team Learning (PLTL) workshops. In the sessions, students work on difficult problems from previous semesters' exams under the supervision of a team leader. The team leaders are graduate teaching assistants, undergraduate teaching assistants, and undergraduate volunteers. For two semesters, team leaders were asked to keep weekly reflective journals. The researchers qualitatively analyzed fourteen journals and found that leaders faced common challenges such as irregular student attendance and inadequate student preparation. Leaders reported that they increased their self-confidence, developed an appreciation for intellectual diversity, and gained an increased interest in

teaching Leading PLTL workshops provides an excellent opportunity for personal development. Leaders gain important insights about other students' perspectives and learn to justify and explain their own work. Leading a PLTL workshop enhances the leaders' ability to collaborate in teams and take on leadership roles in the future.

Johnson, E. C., Robbins, B. A., & Loui, M. C. (2015). What do students experience as peer leaders of learning teams? *Advances in Engineering Education, 4*(4). www.files.eric.ed.gov/fulltext/EJ1077832.pdf.

In a course for engineering freshmen, peer leaders facilitated optional study sessions, which implemented peer-led team learning workshops. Some leaders were paid teaching assistants, but most were undergraduate volunteers. To understand the experiences of the peer leaders, we asked them to keep weekly reflective journals. By performing a basic qualitative analysis of fourteen journals from two semesters, we developed a description of the experience of leading peer-led team learning workshops over the course of the semester. At the beginning of the semester, the leaders were apprehensive about teaching and concerned with correctly answering students' questions. As the semester progressed, the leaders were often frustrated with the difficulty of teaching, and the leaders tried new ways of encouraging student participation. At the end of the semester, the leaders reported that they increased self-confidence, developed an appreciation for intellectual diversity, and gained an increased interest in teaching.

Johnson, E. C., Robbins, B. A., & Loui, M. C. (2017). What do students experience as peer leaders of learning teams? *Advances in Engineering Education, 6*(1). www.advances.asee.org/wp-content/uploads/vol04/issue04/Papers/AEE-16-Loui.pdf.

In a course for engineering freshmen, peer leaders facilitated optional study sessions, which implemented peer-led team learning workshops. Some leaders were paid teaching assistants, but most were undergraduate volunteers. To understand the experiences of the peer leaders, we asked them to keep weekly reflective journals. By performing a basic qualitative analysis of fourteen journals from two semesters, we developed a description of the experience of leading peer-led team learning workshops over the course of the semester. At the beginning of the semester, the leaders were apprehensive about teaching and concerned with correctly answering students' questions. As the semester progressed, the leaders were often frustrated with the difficulty of teaching, and the leaders tried new ways of encouraging student participation. At the end of the semester, the leaders reported that they increased self-confidence, developed an appreciation for intellectual diversity, and gained an increased interest in teaching.

Jones, L. H., Renquette, C., Dflueger, R. C., Weissbach, R., Sorge, B. S., Ice, D., . . . Dasqupta, A. (2020). Replication of a tutor-training method for improving interaction between writing tutors and STEM students. *Praxis: A Writing Center Journal, 17*(3), 59-73. http://www.praxisuwc.com/173-hazeltonjones-et-al.

The improvement of tutor training programs can impact the important work of writing centers. Tutors often feel less comfortable tutoring in genres different from their own discipline. A previous study introduced an assignment-specific tutor training model to improve writing center tutoring sessions between engineering students and writing tutors. The results of the previous study indicated a valuable addition to the resources available for engineering students. This model has now been replicated at two universities to assess the potential for wider dissemination. Preliminary data analysis suggests a relationship between initial tutor rating of student work, student perceptions of tutoring, and tutor perception of student engagement in the tutorial. Plans for future research include continued replication and expansion to test larger sample sizes, analysis of impact within and adaptations for other STEM areas, and continued study of the impact on tutoring team projects.

Kalantarian, N. K., Becvar, J. E., Narayan, M., & Saupe, G. B. (2012). *Enhancement of public speaking paved through Peer-Led Team Learning.* Conference Proceedings of the Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. www.pltlis.org/wp-content/uploads/2012%20Proceedings/Kalantarian-2012.docx

The Department of Chemistry at the University of Texas at El Paso now uses an innovative constructivist approach to address the individualistic learning styles of students in general chemistry. Through funding from an NSF-STEP grant, UTEP has adopted a strong Peer-Led Team Learning (PLTL) curriculum in second semester general chemistry to emphasize team-based, student-directed learning. Students in this three-credit-hour course are required to attend only two hours of lecture each week by adding a small-section two-hour Workshop overseen by a peer leader. Previously, measures of the effectiveness of PLTL Workshop have focused on evaluating the impact on the students taking the chemistry course. However, peer leaders overseeing the Workshop show significant professional growth including enhancement in their public speaking skills. Surveying current, pre and post peer leaders from our institution prompted the creation of an instrument to assess this enhancement. The researchers reported gains of the leaders in confidence and ease in speaking in front of groups. Further evaluation suggests these gains may

be directly correlated with semesters spent as a peer leader.

Komansky, M. (2005). More than just a review session. Peer-led Team Learning: The experience of leading. *Progressions: The Peer-Led Team Learning Project Newsletter, 6*(4). www.pltlis.org/wp-content/uploads/2012/10/Experience-of-Leading-Komansky-More-than-a-Review-Session.pdf.

The authors had been involved in the Peer-Led Team Learning (PLTL) project for Anatomy & Physiology (A&P) for two semesters at Middlesex County College (NJ). In spite of this relatively short time, they generated enormous interest. The PLTL model has broken barriers, helped create friendships and most significantly build confidence of every student involved.

Lamina, O. G., & Aranes, F. Q. (2020). Peer-Led Team Learning (PLTL), Student achievement and engagement in learning chemistry. *SSRN Electronic Journal*. doi: dx.doi.org/10.2139/ssrn.3573527. www.papers.ssrn.com/sol3/papers.cfm?abstract_id=3573527.

The main purpose of this study was to determine the effects of Peer-Led Team Learning(PLTL) strategy on the achievement and engagement level students in Chemistry. Itwas conducted at Casimiro A. Ynares Sr. Memorial National High School, Taytay,Rizal during the third quarter period of the school year 2018-2019. The participants ofthis study were chosen using purposive sampling. The sample students belong to oneintact section of Grade 9 composed of 36 students. This study utilized a one-group pre-experimental research design. The results revealed that there is a significant differencein the chemistry achievement and engagement level of the students before and aftertheir exposure to Peer-Led Team Learning. Significant difference was found in all theCIP engagement factors which are; cooperation, interest and participation after thestudents were exposed to PLTL. In overall there is a significant difference in theengagement mean of students before and after the implementation of PLTL. It wasconcluded that the use of Peer-Led Team Learning had positive effects to the learning achievement in chemistry and engagement of students. The workshop participants revealed they are felt comfortable learning under the peer leaders because theyapproachable and they were able to execute the lessons properly and clearly. The students also enjoyed sharing ideas and working with each other that triggered cooperation among them

Laurs, D. E. (2018). Perceived impact of PASS leadership experience on student leaders' transferable skills development *Journal of Peer Learning, 11*(1), 27-40. www.ro.uow.edu.au/cgi/viewcontent.cgi?article=1138&context=ajpl.

The PASS (Peer Assisted Study Support) program has been operating at Victoria University of Wellington, New Zealand, since 2000, and currently provides weekly study sessions in more than 50 courses each year. As well as enhancing the first-year learning experience, PASS contributes to an institution-wide award that acknowledges the impact of extra-curricular activities on students' graduate attributes and employability skills. Selected from high-caliber candidates, PASS leaders already possess strong communication and thinking skills. Nevertheless, an online survey of current and former leaders between 2009-2014 [n=185] revealed a significant majority perceived that the experience of leading a study group, in particular the associated writing of weekly reflections, enhanced their confidence, cognitive and communication skills, as well as contributing to their CVs and job application success. Such results highlight the potential for student leaders to translate their day-to-day experiences into added value for life after university.

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.

Lindsay, K., Carlsen-Landy, B., Boaz, C., & Marshall, D. (2017). Predictors of student success in Supplemental Instruction courses at a medium sized women's university. *International Journal of Research in Education and Science, 3*(1), 208-217. www.dergipark.ulakbim.gov.tr/ijres/article/viewFile/5000202370/5000179703.

Supplemental Instruction (SI) is a program that seeks to improve student success by targeting classes with high failure rates, as defined with a failure percentage of 30% or more. It is organized by an administrative SI supervisor who supervises SI leaders, which are students that have successfully completed the courses that they have been assigned. The SI supervisor also collaborates with the course instructors who aid in screening the competency of the SI leaders. Improved self-confidence, teamwork, independence and course performance have been reported as benefits of SI. This project sought to explore the effect of SI on success and failure, along with gender, age and race. The type of course was also used as a factor in order to control for it as a confounding variable. In order to ascertain the effect of these variables on success, a technique called logistic regression was used. Caucasian female students who took bacteriology and did not attend SI were used as the reference group. Students were about twice as likely to succeed if they completed the required number of SI sessions and one fifth as likely to succeed if they were in a SI class and did not meet the minimum number of sessions. Hispanic students were 40% as likely to succeed, and African American students were about one third as likely to succeed when compared to Caucasian students. Students between 20 and 29 years old were half as likely to succeed, and those 30 or older were one quarter as likely to succeed when compared to teen students. Those in algebra were about three times more likely to succeed than those in bacteriology, chemistry and statistics. When the students that withdrew were removed, the chances of success were about the same, except for African American students which were one quarter as likely to succeed, and those that did not meet minimum sessions were one quarter as likely to succeed. The model explained more variation when the students that withdrew were included. As SI had a strong influence on success, it should be considered as a tool to enable retention of students in high risk courses.

Liou-Mark, J., Ghosh-Dastidar, U., Samaroo, D., & Villatore, M. (2018). The Peer-Led Team Learning leadership program for first year minority science, technology, engineering, and mathematics students. *Journal of Peer Learning, 11*(1), 65-75. www.ro.uow.edu.au/cgi/viewcontent.cgi?article=1124&context=ajpl.

Retaining students in the Science, Technology, Engineering, and Mathematics (STEM) fields has been a challenge in the United States (U.S.). More startling is the lack of diversity across most of the STEM disciplines. Underrepresented minority groups majoring and graduating in STEM are reported to be far below the national benchmark, and it is not proportionally reflected in the overall national population. To support students in STEM, New York City College of Technology of the City University of New York has designed a Peer-Led Team Learning Leadership Program (PLTL) that recruits and trains upper freshmen majoring in STEM, particularly those who are underrepresented, to facilitate peer-led workshops in foundational STEM courses in chemistry, civil engineering, and mathematics. Results showed the PLTL Leadership Program to be highly effective for first-year underrepresented minority STEM students. First-year students self-reported the peer leading experience had strongly improved their own understanding of chemistry, engineering, and mathematics concepts, and their confidence in these subject areas was significantly increased. They also indicated gains in their confidence in public speaking and in their leadership, communication, and facilitation skills.

Lipsky, S. A., & Kapadia, M. (2013). Effects of work experiences for academic peer educators. *Synergy, 6*, Article 3. www.myatp.org/wp-content/uploads/2015/04/Synergy-Vol-6-Kapadia.pdf.

This study employed a qualitative research model to understand the potential outcomes of the Supplemental Instruction (SI) program on the SI leaders. Thirteen experienced SI leaders participated in focus groups. The study was completed as part of the program's assessment and accountability system in addition to understanding a topic not often investigated in a rigorous fashion. The study revealed several findings: (1) intellectual growth (knowledge of subject matter, learning strategies, and higher-level cognition; (2) personal growth (listening, interpersonal communication, time management, leadership, and self-confidence; and (3) professional growth (work and career-related knowledge and self-efficacy). The SI leaders saw how these skills would be useful as they began their work careers. For SI leaders who had considered a career in education, the experience of serving with the program had solidified their decision. Some SI leaders now were considering a decision or change from previous interests for a career in teaching.

Llaurado, E., Aceves-Martins, M., & Prades-Tena, J. (2022). Adolescents encouraging healthy lifestyles through a peer-led social marketing intervention: Training and key competencies learned by peer leaders. *Health Expectations, 25*(1), 455-465. doi: https://doi.org/10.1111/hex.13406. https://onlinelibrary.wiley.com/doi/epdf/10.1111/hex.13406.

Background Adolescents who participate as peer leaders can benefit and acquire competencies from their peer leadership experience. Objectives To identify the competencies gained by adolescents who participated as peer leaders in a healthy lifestyle study and to determine whether the training characteristics were related to improvement in competencies. Design The present study was part of the European Youth Tackling Obesity (EYTO) project, a multicentre social marketing intervention involving four European countries. Setting and Participants Eighteen peer leaders (aged 13–15 years, three or five leaders per country) from disadvantaged neighbourhoods received training in designing and implementing activities for their peers. Measures The peer leaders' confidence, experience and interest in 11 tasks related to lifelong learning competencies were assessed with questions rated on a colour scale at baseline and at the end of the study. Results The peer leaders demonstrated improvements in experience, confidence and interest in different tasks, such as research, website or logo design, oral presentations, social media use and collaboration with people from other countries. They increased their confidence in management tasks ($p = 0.03$) and their confidence and experience in communication tasks ($p = 0.01$). The peer leaders from Spain and Portugal had greater improvements than those from the other countries. Conclusion The peer leaders improved their confidence in management tasks and their confidence and experience in communication tasks. Slight differences were detected in improvement in competencies by country, likely due to the differences in the peer training applied. Recommendations for peer leader training are proposed, although these results should be verified with larger sample size.

Lockie, N. M., & Van Lanen, R. J. (2008). Impact of the Supplemental Instruction experience on science SI leaders. *Journal of Developmental Education, 31*(3), 2-4, 6, 8, 12, 14.

This article reports on a qualitative study describing the experiences of Supplemental Instruction (SI) leaders in science courses at Saint Xavier University (Chicago, IL). Themes that emerged from this analysis for the SI leaders included: (a) greater appreciation of the diversity of student learning styles; (b) increased understanding of the subject matter; (c) greater self-confidence as learners; (d) development of closer relationships with faculty members; (e) application of the strategies and skills learned as an SI leader in other courses, (f) realization of the importance and values of collaborative learning, leadership and communication skills

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. (1993). *Peer Assisted Study Sessions in anatomy for nursing students.* Conference Proceedings of the Peer tutoring: Learning by teaching, Auckland, New Zealand.

This article describes the use of Peer Assisted Study Sessions (PASS), the local institutional name for their adaptation of the Supplemental Instruction (SI) model at Queensland University of Technology (Brisbane, Queensland, Australia). Following an institutional commitment to Total Quality Management (TQM), some TQM principles were found consistent with the SI model of academic achievement. An anatomy course with first year nursing students was selected as a pilot for the SI program. Program outcomes include the following for SI participants: reported an increase in their confidence with the course after participating in SI sessions (87%); reduced percent of students failing the course (7.8% vs. 19.3%); agreed that the SI leaders motivated them to work harder (80%); increased their learning skills (90%); increased their understanding of the content material (87%); and increased their ability to apply the knowledge gained from class lectures (82%). SI leaders reported the following benefits to them: developed leadership and character, improved their own learning and facilitating techniques, acquired skills in group management, developed presentation skills, and increased their own confidence and self esteem.

Loh, H. (1994). *Strategies to overcome the first year high failure rate in anatomy for nursing students.* Conference Proceedings of the 7th International Conference on the First-Year Experience, Dublin, Ireland.

This paper describes the use of Supplemental Instruction (SI) since 1992 with nursing students at the Queensland

University of Technology (Australia) in an anatomy course (LSB 181). At QUT, SI is known as PASS (Peer Assisted Study Sessions). Data from 1992 through 1995 suggest substantial benefits of the SI program to students, SI leaders and the course instructor. The performance of the students were examined on a 3 to 7 scale (3=fail, 4=pass, 5=credit, 6=distinction, 7=high distinction). SI participant interviews and 1995 survey data suggested agreement with the following statements regarding the impact of SI: increased confidence levels (87.0%), lowered anxiety levels (61.5%), higher motivation to achieve grades of distinction (84.6%), and developed new study skills (70.3%). Based on data from 1992 in the anatomy course the SI participants achieved significantly ($p < .01$) higher levels of academic achievement. In comparison with non-SI participants, there were more grades of level 6 or 7 (39% vs. 27%) and less grades of level 3 (10% vs. 25%). When comparing failure rates, the results favored the SI participants. SI participants in 1995 failed the class at a rate of 2.7% while the non-SI group failed the class at a higher rate of 13.3%. To investigate the possible impact of student motivation, the failure rate of students who desired to participate in SI but were unable to attend due to time conflicts failed at nearly the same rate (12.7%) as the entire non-SI group (13.3%). This appears to support the conclusion that student motivation was not the major variable impacting student academic performance. The overall class average (including all SI and non-SI participants) for grades of level 3 (failure) were reduced from 22.8% before the introduction of SI down to 7.1% after the fourth year of SI. SI leaders reported the following positive results: developed leadership skills; improved their facilitation skills; improved their study skills; acquired group management skills; and increased their own confidence and self-esteem. Instructors who had SI attached to their course reported the following positive results: rapid dissemination of information and instructions to the SI participants; provided benefits of small group instruction within the large lecture sections (n = 400); instructors received feedback from students which allowed them to "fine-tune" teaching and improve teaching performance; involvement with the SI program provided new avenues for grants; enhancement of curriculum vitae; and improved positive attitude and sense of achievement since students improved academic performance.

Loh, H. (1996). *Supplemental Instruction: A peer collaborative learning program applied within anatomy for first year nursing students.* Conference Proceedings of the 2nd Pacific Rim Conference on the First Year in Higher Education, Melbourne, Queensland, Australia.

This paper describes the use of Supplemental Instruction (SI) since 1992 with nursing students at the Queensland University of Technology (Australia) in an anatomy course (LSB 181). At QUT, SI is known as PASS (Peer Assisted Study Sessions). Data from 1992 through 1995 suggest substantial benefits of the SI program to students, SI leaders and the course instructor. The performance of the students were examined on a 3 to 7 scale (3=fail, 4=pass, 5=credit, 6=distinction, 7=high distinction). SI participant interviews and 1995 survey data suggested agreement with the following statements regarding the impact of SI: increased confidence levels (87.0%), lowered anxiety levels (61.5%), higher motivation to achieve grades of distinction (84.6%), and developed new study skills (70.3%). Based on data from 1992 in the anatomy course, the SI participants achieved significantly ($p < .01$) higher levels of academic achievement. In comparison with non-SI participants, there were more grades of level 6 or 7 (39% vs. 27%) and less grades of level 3 (10% vs. 25%). When comparing failure rates, the results favored the SI participants. SI participants in 1995 failed the class at a rate of 2.7% while the non-SI group failed the class at a higher rate of 13.3%. To investigate the possible impact of student motivation, the failure rate of students who desired to participate in SI but were unable to attend due to time conflicts failed at nearly the same rate (12.7%) as the entire non-SI group (13.3%). This appears to support the conclusion that student motivation was not the major variable impacting student academic performance. The overall class average (including all SI and non-SI participants) for grades of level 3 (failure) were reduced from 22.8% before the introduction of SI down to 7.1% after the fourth year of SI. SI leaders reported the following positive results: developed leadership skills; improved their facilitation skills; improved their study skills; acquired group management skills; and increased their own confidence and self esteem. Instructors who had SI attached to their course reported the following positive results: rapid dissemination of information and instructions to the SI participants; provided benefits of small group instruction within the large lecture sections (n = 400); instructors received feedback from students which allowed them to "fine-tune" teaching and improve teaching performance; involvement with the SI program provided new avenues for grants; enhancement of curriculum vitae; and improved positive attitude and sense of achievement since students improved academic performance.

Loh, H. (1997). *Multidisciplinary peer collaborative study programs for first year Aboriginal and Torres Strait Islander students*. Unpublished manuscript. Queensland University of Technology at Brisbane. Queensland, Australia.

This report describes the use in 1995 of Supplemental Instruction (SI) at Queensland University of Technology (Australia) with first year Aboriginal and Torres Strait Islander (A&TSI) students. Many of these students began postsecondary education with high anxiety (79% student response), low to medium confidence in passing their courses, limited knowledge of study skills, and high to moderate difficulty levels within their

respective subjects. A&TSI students had an attrition rate nearly double other students at QUT (32.7% vs. 18.4%). About half the A&TSI students participated in the SI program. Using a four point scale (greatly, moderately, slightly, not at all), data obtained from end of academic term student surveys of SI participants suggests that SI: was helpful for increased learning (70% of students selected "greatly"), lowered anxiety levels (45% greatly and 45% moderately), increased confidence levels (50% greatly, 50% moderately), improved enthusiasm and motivation to perform better (45% greatly, 45% moderately), and helped to create a favorable environment supporting learning (100% greatly). SI participant grades were evaluated on a seven point scale: fail, one to three; pass, 4; credit, 5; distinction, 6; high distinction, 7. When analyzing the grade distribution for all A&TSI students, 22.9% of SI participants earned grades of 6 or 7 as compared with 0% for the non-SI. When examining the failing grades (1, 2 or 3) the SI group had a dramatically lower rate (22.8%) when compared with the non-SI group (78.3%). SI leaders reported that their participation in the program led to the following outcomes: developed facilitation and group organizational skills; improved confidence and self esteem; and developed their own learning skills.

Loh, H., & Kelly, B. A. (1994). *Supplemental Instruction (SI) in anatomy for first year nursing students*. Unpublished manuscript. The Queensland University of Technology. Brisbane, Australia.

This paper describes the use of Supplemental Instruction (SI) since 1992 with nursing students at the Queensland University of Technology (Australia) in an anatomy course (LSB 181). At QUT, SI is known as PASS (Peer Assisted Study Sessions). The SI modeled was contextualized in several ways: two SI leaders facilitated each group, allowing for larger numbers to attend each SI session; principles of Total Quality Management were employed to use SI as a feedback loop between the students and the lecturer, thereby providing data to the instructor to allow for immediate changes in the content and delivery. Data from 1992 through 1995 suggest substantial benefits of the SI program to students, SI leaders and the course instructor. The performance of the students were examined on a 3 to 7 scale (3=fail, 4=pass, 5=credit, 6=distinction, 7=high distinction). SI participant interviews and 1995 survey data suggested agreement with the following statements regarding the impact of SI: increased confidence levels (87.0%), lowered anxiety levels (61.5%), higher motivation to achieve grades of distinction (84.6%), and developed new study skills (70.3%). Based on data from 1992 in the anatomy course, the SI participants achieved significantly ($p < .01$) higher levels of academic achievement. In comparison with non-SI participants, there were more grades of level 6 or 7 (39% vs. 27%) and less grades of level 3 (10% vs. 25%). When comparing failure rates, the results favored the SI participants. SI participants in 1995 failed the class at a rate of 2.7% while the non-SI group failed the class at a higher rate of 13.3%. To investigate the possible impact of student motivation, the failure rate of students who desired to participate in SI but were unable to attend due to time conflicts failed at nearly the same rate (12.7%) as the entire non-SI group (13.3%). This appears to support the conclusion that student motivation was not the major variable impacting student academic performance. The overall class average (including all SI and non-SI participants) for grades of level 3 (failure) were reduced from 22.8% before the introduction of SI down to 7.1% after the fourth year of SI. SI leaders reported the following positive results: developed leadership skills; improved their facilitation skills; improved their study skills; acquired group management skills; and increased their own confidence and self esteem. Instructors who had SI attached to their course reported the following positive results: rapid dissemination of information and instructions to the SI participants; provided benefits of small group instruction within the large lecture sections (n = 400); instructors received feedback from students which allowed them to "fine-tune" teaching and improve teaching performance; involvement with the SI program provided new avenues for grants; enhancement of curriculum vitae; and improved positive attitude and sense of achievement since students improved academic performance.

Lozada, N., & Johnson, A. T. (2018). Perspective transformation in the Supplemental Instruction (SI) leader. *Journal of Transformative Education*. doi: 10.1177/1541344618774544 doi-org.ezp3.lib.umn.edu/10.1177/1541344618774544

This qualitative case study explores how former Supplemental Instruction (SI) leaders experienced perspective transformation as a result of serving in a peer leadership role at a 4-year, private university through a blended theoretical framework based on the principles set forth by Mezirow and Nohl. Through their participation in interviews and graphic elicitations, former SI leaders offered valuable insights concerning the transformative nature of student leadership and its impact on the emerging sense of self in social and learning contexts. This study also assists in filling the void in research on how undergraduate students benefit by serving in a leadership role within a peer-facilitated academic assistance program in higher education. Participants communicated that working in an SI program provided them the ability to develop meaningful relationships with faculty, students, and peer SI leaders, which, in turn, fostered a greater sense of campus engagement and interest in other student leadership positions. Former SI leaders also expressed increased levels of confidence as they learned to navigate their student–facilitator roles.

Lu, C. (2012). *How can the peer leader support students' learning in workshop?* Conference Proceedings of the Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. www.pltlis.org/wp-content/uploads/2012%20Proceedings/Lu-2012.docx

Peer-led workshops usually consist of 6-8 students who come together to discuss and solve problems on modules given to them each week. Workshop students often lack confidence in their ability to solve problems in mathematics. Comparison is a big factor in lack of confidence, especially in group-based work. Students usually compare themselves with others based on how fast they could learn new material or complete assignments. Students also compare their own abilities to contribute to teamwork to their teammates, resulting in hesitating to ask for help. Grades and the amount of material students master is also a big factor to compare. Gender roles are another factor in lack of confidence. Men usually conclude they are superior to their peers and women usually conclude they are inferior. When facing challenges, women tend to dwell on their failures and men only rarely. In situations where students find themselves inferior to others, they lose confidence. Faculty play a big part in increasing confidence in students; they could also explain to students that how long it takes to solve a problem is less important than understanding and solving it.

Lundeberg, M. A. (1990). Supplemental Instruction in chemistry. *Journal of Research in Science Teaching, 27*(2), 145-155.

This two-year study (148 students) at the University of Wisconsin (River Falls, WI) was designed to measure some effects of Supplemental Instruction in General Organic and Biological chemistry courses. Goals of the SI program included: develop conceptual understandings; articulate both understandings and misconceptions in a think-aloud fashion; connect, relate, and integrate scientific information; develop confidence and ability in problem solving; and learn how to learn science. Some of the challenges with students are: motivating students to use problem-solving strategies; failure to accurately understand the problem before using a problem-solving strategy; attempt to use rote memory when solving; and failure to integrate new material with old. Quantitative studies suggested that SI contributed to higher mean final grades (2.80 vs. 2.26, $p < .002$) and lower rates of D, F and withdrawals for SI participants. Qualitative studies of SI participant comments suggested that SI was helpful in a variety of ways. In addition, SI leaders maintained journals. Six themes emerged from the journals: accommodating needs of diverse learners; understanding versus memorizing; depth versus breadth of discussion; relationships between ability, knowledge, and confidence; social relationships with students; and challenges to SI leaders' knowledge. The first three of these themes represent tensions that reoccurred several times over the academic term.

Malm, J. (2021). Enhancing employability skills through being an SI-PASS leader. In A. Strømmen-Bakhtiar, R. Helde & E. Suzen (Eds.), *Supplemental Instruction: Organisation and leadership, volume 3* (pp. 75-84). Munster and New York: Waxmann.www.www.waxmann.com/index.php?eID=download&buchnr=4326.

The present study focuses on the potential benefits of the SI-PASS experience for former leaders in their professional life after graduating from higher education. This topic has received little attention, with the few studies being limited by the small number of participants and the approaches used and questions asked. The present survey was sent to 279 former SI-PASS leaders who graduated from the School of Engineering at Lund University, Sweden, during the period 2010–2019. A total of 91 (33%) responded. The results show that the main qualities developed through SI-PASS leadership are leadership confidence and facilitation and presentation skills. These are qualities that are appreciated by many former leaders in their professional life. Almost all of the respondents report that they have had at least a little use of SI-PASS trained qualities in their job, and half report good to very good use. More than 80% of the respondents believe that being an SIPASS leader helped them in getting hired for a job, at least to some extent.

Malm, J., Bryngfors, L., Carey, W., Holmer, A., L.-L., M., & Ody, M. (2019). *Status report for European SI/PASS/PAL-programmes*. www.si-pass.lu.se/sites/si-pass.lu.se/files/status_report_european_web_feb2019.pdf

This report is based on the contributions from SI/PASS/PAL supervisors at 63 Universities in Europe to a basic survey of 13 questions. Each institution that responded to the survey was invited to provide more detailed information about the programme including attendance statistics and examples of evaluation/impact; 45 universities provided these more detailed responses. At present, there are nine countries in Europe (mostly in the north-western part) with SI/PASS/PAL schemes. However, with supervisors trained recently from Belgium and Spain it is likely that an expansion will happen in the near future. There is a great variation in the programmes described below, which is a strength when growing the SI/PASS/PAL community. Some are quite small with one supervisor, a handful of Leaders and SI/PASS/PAL attached to a single subject. Others are huge with 10+ supervisors, several hundreds of leaders and where SI/PASS/PAL is attached to 100+ courses in all subject areas. Some programmes are relatively old and have existed since the mid-1990s when SI expanded beyond the borders of the US, while others are just about to start with a pilot. Furthermore, paying Leaders is usually the case in the Scandinavian countries, while the opposite seems to

be generally true in Great Britain. Similarly, Leaders usually work in pairs in Britain while often working alone in Sweden. In common for all SI/PASS/PAL programmes are the initial training and continuous support of the Leaders and a follow-up/evaluation of the programme outcomes. The objectives with introducing or having SI/PASS/PAL varies between Higher Education Institutes (HEIs), illustrating how many different areas the learning model may address. Some examples of goals extracted from the Case Studies in the following pages are: improving student performance and retention, increasing student engagement with the subject and their understanding, to complement ordinary education and have organized study groups with a facilitator, enhancing students early learning experiences and let students see their peers as learning resources, to support: (1) a successful transition to higher education, (2) help 1st year students develop a sense of belonging, (3) academic success, (4) student health and wellbeing, (5) progression. Although Supplemental Instruction (SI), Peer Assisted Study Sessions/Schemes (PASS), and Peer Assisted Learning (PAL) are the common names for the learning programme, some HEIs show great ingenuity in finding other names. Having their own local name can be important for the HEI in marketing and identifying their programme internally. However, there are some dangers to be aware of. In Appendix 2, all Higher Education Institutes (HEI) in Europe are given that have had employees trained to SIsupervisors by the European Centre for SI-PASS or earlier regional centres in Europe. Furthermore, in the appendix HEIs are marked that have active SI-programmes (based on either answering surveys or having web-sites that indicate active programmes). To date, 137 HEIs in Europe have had employees trained as supervisors in SI. 73 (53 %) of these have active SI-Programmes. names may lead to confusion if we are talking about the same type of programme, potentially hindering information exchange. Secondly, when creating an own brand name it might be tempting to stray from the original model. Whilst this may be appropriate for the HEI, this means that the programme will not be comparable with others. The strength of the SI/PASS/PAL model lies in having the same essential elements in the programme (see appendix) and it is important that practitioners adhere to it if they want to compare results and impact of their programmes across institutional and national borders. The SI/PASS/PAL learning model is well established at many HEIs in northern Europe. Whilst we know there are some HEIs that have yet to respond to the first call for information from the 63 programmes responding to the survey, we can make the following estimates (based on the estimate that 73 HEIs have active SI/PASS/PAL programmes): there are ~290 trained supervisors actively involved in the SI/PASS/PAL programmes, approximately 8,400 SI/PASS/PAL-leaders are employed each year, on average the leaders hold about 15 sessions during an academic year being 0,5-3 hours in length, there are ~1,530 courses supported by SI/PASS/PAL each year, the number of students having access to SI/PASS/PAL per year is ~141,200, the number of students attending at least one time per year is ~81,600 (58 % of those having access), the average attendance on SI/PASS/PAL sessions is ~31 %, the average number of students at a session is ~10, the number of contact hours is ~809,000 during an academic year. (Contact hours are the total number of hours students visit sessions during a year). The various follow-up and evaluation examples from different HEIs illustrate that many of the intended goals of SI/PASS/PAL programmes are met. Some examples provided in the Case Studies later in this publication include: higher student performance, improved communication and leadership skills as well as increased employability for Leaders, increased confidence for new students with regard to the student support the HEI gives, improved learning experience for students, teachers are provided with valuable information from Leaders on areas the students struggle with, improves and reduces questions from students to teachers. An area where the SI/PASS/PAL community in Europe can improve is in publishing their initiatives, experiences, and research studies. Hopefully, the examples below can serve as an inspiration to present your own material and conduct research.

Malm, J., Bryngfors, L., & Morner, L.-L. (2012). Benefits of guiding Supplemental Instruction sessions for SI leaders: A case study for engineering education at a Swedish University. *Journal of Peer Learning, 5*(1). www.si-mentor.lth.se/fileadmin/lth/omlth/pedagogiskaprojekt/simentor/Benefits_of_guiding_JPL.pdf.

The study indicates that students who work as Supplemental Instruction (SI) leaders gain several benefits from their SI experience. The benefits can be divided into the following main themes: Improved communication skills; Improved interpersonal skills (including abilities to listen to other people's thoughts and reasoning; creating trust between yourself and your group members; to meet and inspire different individuals; to make a group of individuals enthusiastic about performing a task; and to get students to help each other); Improved leadership skills (including being a leader of a group, talking in front of others, leading a discussion, organizing the work for a group, and creating an easy-going, positive, and supportive atmosphere at the learning sessions); Improved self-confidence; and deeper understanding of course content

Martinez, G. S. (2022). The impact of Peer-Led Team Learning (PLTL) on the life of a Latina. *Advances in Peer-Led Learning, 2*(1), 111-116. doi: https://doi.org/10.54935/apll2022-01-09-111. https://doi.org/10.54935/apll2022-01-09-111.

As a Latina at a Hispanic Serving Institution, I joined the Peer-Led Team Learning (PLTL) program at the University of

Texas at El Paso to overcome my language insecurity, gain confidence, persevere, and become a more successful student. Peer leading has helped me boost my confidence, gain better communication and time management skills, learn to work under pressure, manage difficult situations, and improve my ability to work with diverse students. In addition, it increased my sense of responsibility. The PLTL program is advantageous for both students and Peer Leaders alike because each group learns from the other while overcoming challenges together. Peer Leaders learn to communicate effectively while allowing space and time for students to make mistakes, collaborate with one another, and learn through engaging activities. As a Latina Peer Leader, I was also able to foster collaboration between Hispanic and non-Hispanic students, promoting inclusion in a friendly workshop environment that promoted high participation.

Maxwell, M. C., & Wiles, J. R. (2022). Cyber Peer Led Team Learning (cPLTL) supports marginalized groups, including women, in science, technology, engineering, and mathematics (STEM). *Bioscene: Journal of College Biology Teaching, 48*(1), 10-16. http://files.eric.ed.gov/fulltext/EJ1350834.pdf.

Peer Led Team Learning (PLTL) is an active learning model that is particularly effective for improving the academic achievement and retention of students who have been marginalized in Science, Technology, Engineering, and Mathematics (STEM), such as women, and members of underrepresented minority groups. Cyber Peer Led Team Learning (cPLTL) is a recently developed variation of PLTL that has been transitioned from a face-to-face environment to a synchronous online setting. Studies have found that PLTL and cPLTL students earned comparable educational outcomes in terms of standardized final exam scores and final course grades. Given the benefits of PLTL for marginalized students and the similarities of cPLTL to PLTL, we were interested in understanding the impact that cPLTL had on marginalized groups, including women, in an introductory biology course at a large, research-intensive institution. We found evidence that participating in cPLTL improves the retention of marginalized groups in STEM, and that student perceptions of cPLTL are generally high, especially for women. Participating in cPLTL may have several additional benefits, such as increased motivation, feelings of belonging, comfort in asking questions, and understanding of course content.

Merwin, D. D. (1991). A comparative analysis of two tutoring methods assessing student achievement and retention [Dissertation, Montana State University, 1990]. *Dissertation Abstracts International, 52*(02), 438A. (University Microfilms No. 9109700).

The purpose of this doctoral dissertation research study was to compare the effectiveness of two tutoring methods with regard to achievement and retention for high-risk undergraduate students at Northern Montana College (Havre, MT) enrolled in English 150 during the 1986-87 academic school year (eleven courses sections over the fall, winter and spring academic terms). Supplemental Instruction (SI) was compared with another form of tutoring. English 150 is a three-credit course considered to be developmental in content since it encompassed the basic skills areas (sentence structure, parts of speech, grammar, usage, punctuation, and paragraph development). The two tutoring methods were group tutoring (i.e., Supplemental Instruction, or SI) and individual tutoring. The treatment was randomly assigned to each of the eleven course sections and attendance was mandatory by the students. The problem was investigated by: (1) examining how the tutoring methods and other independent variables affected student achievement and student retention, and (2) comparing the two tutoring methods in terms of cost effectiveness. Achievement was measured by the pretest-posttest gain score from the Tests of Adult Basic Education (TABE). The TABE test for English measured students' competency in capitalization, punctuation, expression, and spelling. Retention was measured by the ratio percentage of the number of student credit hours earned compared to the number of hours attempted for the first and second years following treatment. The cost effectiveness of both tutoring methods was compared by determining

the cost of one grade level of improvement. Some of the major findings were: students in SI tutoring had higher retention rates than students receiving individual tutoring for the first and second years following treatment; the combined results of the two tutoring methods did make a significant difference in student achievement; the SI tutoring method compared to the individual tutoring method was more cost effective ($3.46 average cost for SI program to improve one grade level of one students vs. $16.30 for one-on-one tutoring to do the same); and individual tutoring had a relatively short-term effect. An unexpected finding was that students who participated in SI groups continued to meet at other times outside of class and that the groups were heterogeneous groupings. Interviews with these students revealed that they had met the other students through the SI sessions. It was assumed that students would tend to meet with their own homogeneous affinity groups. The SI students revealed that they enjoyed the social interactions in the groups and felt more comfortable working with other SI participants when they needed additional academic assistance with the English 150 course. The SI program also had an impact upon the SI leaders. Three of the seven SI leaders changed their degrees -- two were business majors and one was a vocational-technical major -- to education so they could become professional teachers. One-on-one tutors reported frustration with the tutoring program when students canceled their scheduled tutoring sessions. Since SI leaders worked with groups, they did not encounter that problem.

Micari, M., & Drane, D. (2011). Intimidation in small learning groups: The roles of social-comparison concern, comfort, and individual characteristics in student academic outcomes. *Active Learning in Higher Education, 12*(3).

This study examines the relationship of social-comparison concern, comfort, and self-efficacy to course performance and program persistence in a small-group learning environment. As part of the study, 205 undergraduates in a peer-led, small-group science learning program were surveyed at the beginning and end of the academic term; surveys addressed self-efficacy for the course, comfort participating in the small groups, and concern about comparison with others in the groups. Results indicated that while social-comparison concern and comfort were unrelated to prior academic preparation (as measured by grade point average and SAT mathematics score), they were related to self-efficacy, ethnic minority status, and gender, as well as to persistence in the program and final grade.

Micari, M., Pazos, P., Streitwieser, & Light, G. (2010). Small-group learning in undergraduate STEM disciplines: effect of group type on student achievement. *Educational Research and Evaluation, 16*(3), 269-286. doi: 10.1080/13803611.2010.520860.

Small-group learning in the science, technology, engineering, and mathematics (STEM) disciplines has been widely studied, and it is clear that this method offers many benefits to students. Less attention has been paid to the ways in which small learning groups differ from one another, and how these differences may affect student learning and experiential outcomes. This study uses a previously validated instrument to categorize, or type, small peer-led STEM learning groups, and then to investigate the impact of group characteristics on student outcomes. Six hundred and forty-six students were observed over 2 academic quarters. During the fall quarter, no relationship was found between group type and student course grade. During the winter quarter, statistically significant differences in student grade were found among group types. We posit that group type may not make a difference in grade early in the year because the groups are not yet functioning optimally, so that group “noise”, such as facilitator inexperience or student discomfort, may drown out the effects of group type on student performance.

Micari, M., Streitwieser, B., & Light, G. (2006). Undergraduates leading undergraduates: Peer facilitation in a science workshop program. *Innovative Higher Education, 30*(4), 269-288. doi: 10.1007/s10755-005-8348-y.

This article presents the results of a study at Northwestern University concerning experiences of undergraduate students serving as facilitators of Peer led Team Learning (PLTL) sessions for introductory undergraduate sciences and engineering course. The PLTL facilitators reported growth in a variety of areas: cognitive

growth (consolidating knowledge in the discipline, enhancing conceptual understanding, and developing problem-solving skills); personal growth (communication skills in confidence, audience understanding, and self-expression; pedagogical skills; improved ability to explain concepts; and skill at learning to allow students to work out their ideas on their own without interrupting to offer guidance; understanding the role of the teacher); and instrumental growth (career development and striving to achieve professional goals).

Miller, I., & Sadler-McKnight, N. (2012). *Implementation and institutionalization of PLTL in a Caribbean university: Successes, challenges, and implications.* Conference Proceedings of the Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. www.pltlis.org/wp-content/uploads/2012%20Proceedings/McKnight-PLTLIS-2012.pptx

Peer-Led Team Learning (PLTL) workshops significantly improved performance in introductory chemistry as well as increased student self-confidence and attitude towards chemistry. Participation in both semesters results in better performance than in one semester only. The PLTL model provides an atmosphere in which students freely express themselves, show less fear of failure, and develop the self-confidence and problem solving skills that are necessary for independent learning. Results point to the need for institutionalization of the PLTL model to include all Year 1 students as well as other subjects e.g. Math, Physics, etc. Need for a PLTL programme director who can focus on coordinating the programme and need to revisit our mode of instruction.

Miller, V., Oldfield, E., & Bulmer, M. (2004). *Peer Assisted Study Sessions (PASS) in first year chemistry and statistics courses: Insights and evaluations.* Conference Proceedings of the UniServe Science Scholarly Inquiry Symposium, Sydney, Australia. www.science.uniserve.edu.au/pubs/procs/wshop9/schws003.pdf

Peer Assisted Study Sessions (PASS), based upon the Supplemental Instruction (SI) model, was used in first year chemistry and statistics courses at the University of Queensland in Australia. This study analyzed results from 2003 and found that PASS participants earned higher final course grades than nonparticipants. Other reported positive outcomes through qualitative research findings were higher student confidence, increased desire to continue in the academic discipline, increased in analytical and creative approach to learning, and greater sense of belonging within a community of learners.

Mills, S. R. (1999). Academic excellence workshops in chemistry and physics (Uri Treisman) [Dissertation, The Claremont Graduate University, 1999]. *Dissertation Abstracts International, 60*(06), 1968.

In the mid-1970's, Dr. Uri Treisman, at the University of California, Berkeley, developed an academic excellence workshop program that had important successes in increasing minority student achievement and persistence in calculus. The present dissertation research is an in-depth study of chemistry and physics workshops at the California State Polytechnic University, Pomona. Data for the first, longitudinal component of this study were obtained by tracking to Spring 1998 all workshop minority students, i.e., Latino, African American, and Native American workshop students, a random sample of non-workshop minority students, and a random sample of non-targeted students, i.e., Anglo and Asian students, enrolled in first-quarter General Chemistry or Physics during specific quarters of 1992 or 1993. Data for the second component were obtained by administering questionnaires, conducting interviews, and observing science students during Fall, 1996. Workshop participation was a significant predictor of first-quarter course grade for minority students in both chemistry and physics, while verbal and mathematics Scholastic Aptitude Test (SAT) scores were not significant predictors of beginning course grade for minority science students. The lack of predictive ability of the SAT and the importance of workshop participation in minority students' beginning science course performance are results with important implications for educators and students. In comparing pre-college achievement measures for workshop and non-targeted students, non-targeted students' mathematics SAT scores were significantly higher than chemistry and physics workshop students' scores. Nonetheless, workshop participation leveled the field as workshop and non-targeted students performed similarly in beginning science courses. Positive impacts of workshop participation on achievement, persistence, efficiency, social integration, and self-confidence support the continued and expanded funding of workshop programs. This research also studied how gender and ethnicity affect attitudes, achievement, and persistence in science courses and mathematics-based majors. College-level females, both minority and non-minority, in science showed no differences from males or were in fact more positive about science than males. However, in interviews, minority females expressed concerns about gender and believed gender to be more important in their science experiences than ethnicity. This research suggests intervention programs to increase the number of females in the science- and technology-based job pipeline can be successful.

Molloy, J. (2017). Reinforcing medication administration through student-directed simulation. *Teaching and Learning in Nursing*.

Medication errors are a threat to patient safety, and the distress experienced by nurses affects their confidence and

practice. Nursing students have reported a decrease in medication administration in the clinical setting. This article documents the creation of a pilot study to explore the potential for a teaching approach that utilizes senior students as mentors in a simulation laboratory to practice medication administration. Results revealed that all students reported an increased competence and confidence to administer medication autonomously in the future.

Morse, C. (2020). *Perceptions and motivations of associate degree nursing students engaged in peer mentoring and tutoring through Supplemental Instruction.* (Ph.D. dissertation), Capella University.

High attrition rates in associate degree nursing (ADN) programs contribute significantly to a nursing shortage in the United States that is expected to worsen. Nursing students find the learning environment stressful, intimidating, and overwhelming, leading to discouragement in the first year of their nursing education. Research is needed to identify specific retention strategies that can offer ADN students additional support and promote academic success. This study aimed to explore first-semester ADN nursing students' experiences with peer mentoring and peer tutoring provided through supplemental instruction (SI). Three research questions guided the present study. How do students pursuing an associate nursing degree describe their experiences participating in supplemental instruction? What are the peer mentoring experiences of students pursuing an associate nursing degree after participating in a peer tutoring program provided through supplemental instruction? How do nursing students pursuing an associate degree describe the role of peer mentoring in their motivation for academic success and persistence? A basic qualitative study was conducted, and participants' descriptions of their experiences participating in SI were documented using semi-structured interviews. The target population focused on first-semester ADN nursing students, and the sample consisted of students in an ADN nursing program that offered peer mentoring and tutoring through SI. A 13-step thematic analysis process was used to code the participants' data and develop thematic findings to answer the study's research questions. The analysis process resulted in the identification of six themes. The findings indicated that students feel SI is a positive experience, but improvement is needed. Exposure to different perspectives through peer mentoring and tutoring improved students' understanding of course material. Stronger peer relationships created consistency for students. Peer mentoring boosted self-confidence among first-semester students, and attendance at SI sessions increased persistence. The findings support the use of peer mentoring to offer academic assistance to first-semester ADN students.

Muller, O., Scacham, M., & Herscovitz, O. (2017). Peer-led Team Learning in a college of engineering: First-year students' achievements and peer leaders' gains. *Innovations in Education & Teaching International*. doi: 10.1080/14703297.2017.1285714. www.srhe.tandfonline.com/doi/full/10.1080/14703297.2017.1285714?scroll=top&needAccess=true.

Due to high dropout rates (30%) among first-year students, our college of engineering operates programmes for promoting students' retention and learning. The peer-led team learning (PLTL) programme accompanies Science, Technology, Engineering and Mathematics introductory courses with a high rate of failures, and incorporates workshops of small groups of students for developing active-learning and problem-solving skills. The workshops are led by outstanding students from advanced years; the peer leaders (PL). This study focused on the effects of the PLTL programme (40 workshops, 26 PLs) on the achievements of students who participated in the workshops compared with those who did not, and on its impact on the PLs. Findings reveal that workshops advance students of all levels and improve their achievements in several courses, while contributing more to students with higher academic capabilities. PLs felt satisfaction and believe they have gained self-confidence, and mentoring and communication skills for their future careers.

Muller, O., Shacham, M., & Herscovitz, O. (2018). Peer-led team learning in a college of engineering: First-year students' achievements and peer leaders' gains. *Innovations in Education adn Teaching International, 55*(6), 660-671. doi: 10.1080/14703297.2017.1285714.

Due to high dropout rates (30%) among first-year students, our college of engineering operates programmes for promoting students' retention and learning. The peer-led team learning (PLTL) programme accompanies Science, Technology, Engineering and Mathematics introductory courses with a high rate of failures, and incorporates workshops of small groups of students for developing active-learning and problem-solving skills. The workshops are led by outstanding students from advanced years; the peer leaders (PL). This study focused on the effects of the PLTL programme (40 workshops, 26 PLs) on the achievements of students who participated in the workshops compared with those who did not, and on its impact on the PLs. Findings reveal that workshops advance students of all levels and improve their achievements in several courses, while contributing more to students with higher academic capabilities. PLs felt satisfaction and believe they have gained self-confidence, and mentoring and communication skills for their future careers.

Murray, M. H., Grady, J., & Perrett, S. (1997). *Students managing students' learning*. Paper presented at the 9th

Annual Conference of the Australian Association of Engineering Education.

This paper describes the use of Supplemental Instruction (SI) at Queensland University of Technology (Brisbane, Australia) in engineering classes (Engineering Mechanics I and II). Student participant comments said that participation in SI sessions: developed greater understanding, more helpful than tutorials, made discussions more enjoyable, developed greater confidence, enjoyed group work, and found the atmosphere more relaxed and helpful. SI leaders mentioned the following benefits for themselves: reinforced own learning and study skills, developed more confidence, made academic coursework more challenging and satisfying.

Oppland-Cordell, S. B. (2014). Urban Latina/p undergraduate students' negotiations of identities and participation in an Emerging Scholars Calculus I Workshop. *Journal of Urban Mathematics Education, 7*(1), 19-54. www.ed-osprey.gsu.edu/ojs/index.php/JUME/article/view/213/151.

In this article, the author presents a qualitative multiple case study that explored how two urban Latina/o undergraduate students' emerging mathematical and racial identity constructions influenced their participation in a culturally diverse, Emerging Scholars Program, Calculus I workshop at a predominately White urban university. Drawing on critical race theory and Latina/o critical theory, cross-case analysis illustrates that participants' emerging mathematical and racial identities—co-constructed with their other salient identities—contributed to positively shifting their participation by: (a) changing their perceptions of their and peers' mathematics abilities, (b) allowing them to challenge racialized mathematical experiences, and (c) strengthening their comfort levels in the workshop environment. The Latina/o participants' counter-stories support that the sociopolitical nature of identity development and participation in mathematical learning contexts should be embraced because it provides additional knowledge regarding how and why Latina/o students attain mathematical success.

Paideya, V. (2011). Engineering students' experiences of social learning spaces in chemistry Supplemental Instruction sessions. *Alternation, 18*(2), 82-95. www.utlo.ukzn.ac.za/Files/Alternation%2018.2%20%282011%29.pdf.

Students regarded their experiences of the social learning spaces created in the chemistry Supplemental Instruction (SI) sessions as inspiring because of the support they received from SI leaders and peers. SI has been introduced to the first hyear engineering and mainstream chemistry students at the University of KwaZulu-Natal as part of the "Through0ut in Engineering Sciences (TIES) program. SI participants developed a better understanding of concepts through exposure to different points of view and different pedagogical activities offered. The findings indicate that the different pedagogical and learning techniques offered in the SI social learning spaces accommodated for the diversity of students' learning needs, encouraging students to take responsibility for their learning through feedback, motivation and support. Social spaces served for mini revision of concepts, explanations and discussions that improved understanding of concepts and collaboration amongst peers which increased students' confidence in answering questions. The findings from this study show that SI social learning spaces create opportunities for learning engagement that differ from lectures in many ways, particularly as they relate to: (a) offering more opportunities for practice and reflection; (b) access to a variety of questions; (c) access to support and immediate feedback; (d) opportunities for collaboration; (e) students taking responsibility for learning; and (f) motivation to learn. Students commented that student focused learning, which involved peer teaching and learning, encouraged them to: (a) develop thinking, reasoning and social skills which enabled them to engage with the problem solving activities more effectively; (b) develop confidence with respect to making appropriate choices in terms of chemistry concepts; and (c) explore, question and research other alternates as a fundamental component of their learning. It is evident from these responses that students who engaged in these social learning spaces developed a better understanding of concepts through collaboration. It is therefore argued that the social learning spaces created during the SI intervention session have the potential to develop independent lifelong learners in chemistry.

Perez, J. O., Wachs, F. L., Jones, B., Barrios, D. M., Gossage, L. G., & Nguyen, H. (2022). *Enhancing students' outcomes in gatekeeper engineering courses through Technology-Assisted Supplemental Instruction (TASI).* Conference Proceedings of the Excellence through Diversity ASEE Annuasl Conference, Minneapolis, MN. file:///C:/Users/Owner/Desktop/enhancing-students-outcomes-in-gatekeeper-engineering-courses-through-technology-assisted-supplemental-instruction-tasi%20(1).pdf

Tutoring is an intervention that universities implement to ease students' adjustment to college courses and reduce achievement disparities. Several studies indicate that tutoring helps students develop their identities as learners and provides a sense of belonging at their institutions. While many programs focus on freshman, this program focus on upper-division students, something essential at a university with a high proportion of transfer students. This program focused on assisting students in gate-keeper engineering courses with high failure rates as part of a larger institution-wide HSI grant. Technology-Assisted Supplemental Instruction (TASI) is a peer-led tutoring service with the goal of persistence of students and student facilitators as

measured by their academic performance and sense of belonging. Instead of the traditional one-to-one (one section for one SI) this study looks at using technology to service all sections of a class with one facilitator. Surveys were distributed to STEM students measuring their sense of belonging in their field and university, confidence in their abilities, and demographic information. In addition, data on academic outcomes and attendance for tutoring sessions were collected. Statistical analyses revealed that in three different versions of Statics courses, TASI was significant in impacting course grades between students who attended compared to those who did not attend. Also, when comparing TASI's impact before the transition to online and after, TASI was statistically significant in two courses while online, indicating more students used the service during the pandemic. In the surveys, students reported a high sense of belonging in both their field of study and at the university yet, many students indicated facing challenges such as balancing life obligations, studying for exams, and completing course assignments. Additionally, surveys revealed that while students are confident in their abilities, when compared to their peers, their confidence decreased. TASI helped students better comprehend course material and provided them more accessible support. Providing students with resources such as TASI will help students feel more motivated to persist and obtain better grades. This assistance can reduce the complex challenges students face with their courses.

Perez, J. O., Wachs, F. L., Nguyen, H., Jones, B., Barrios, D. M., & Gossage, L. G. (2022). *Supplemental Instruction to decrease equity gaps in gate-keeper engineering courses (ERM).* Conference Proceedings of the Excellence through Diversity ASEE Annual Conference, Minneapolis, MN. file:///C:/Users/Owner/Desktop/supplemental-instruction-to-decrease-equity-gaps-in-gate-keeper-engineering-courses-erm%20(1).pdf

This study explores the impact of Technology-Assisted Supplemental Instruction (TASI) on the sense of belonging and academic achievement of URM identified students in Statics courses at a large public HSI university. TASI is a peer-led tutoring service in partnership with faculty support that targets high failure rate STEM courses, in this case, three different iterations of Statics. Students completed four surveys that measured demographics, sense of belonging in their field of study, and confidence in their ability to do well in their courses. In addition, TASI attendance, students' academic and enrollment data were collected. Preliminary belonging data at the beginning of the term showed the nearly 80% of Latinx students agreed with the statements: "I sometimes feel like other students in my field of study have skills that I do not," and "When I struggle in a class I feel that I don't belong in the field". Linear regression also shows that the main predictor of student grades in Statics are identifying as a URM student or Pell recipient. TASI has the goal of increasing academic support and therefore performance to alleviate these feelings and ensure student persistence. Using matched pairs analysis, the data shows a statistically significant increase of 0.4 to 0.5 in course grade on a 4-point scale. These results were most apparent in URM students. The rate of failing grades for URM students decreased up to twenty percent (depending on the section). The impact of the TASI is more evident for students of color during the COVID pandemic and virtual learning. The use of an anti-deficit lens highlights how imperative it is to have meaningful, useful, and accessible interventions. Student facilitators, access, and awareness of programs are noted as crucial to success.

Phelps, J. M., & Evans, R. (2006). Supplemental Instruction in developmental mathematics. *The Community College Enterprise (formerly Michigan Community College Journal), 4*(6).

After an extensive review of the professional literature concerning Supplemental Instruction (SI), especially among community colleges, the articles focuses on its use at Valencia Community College in Orlando, FL during 2003 and 2004. Results included: increase in completion rate of the course (52% vs. 35%); higher final course grade (2.57 vs. 2.22; SI participants reported a lower level of test anxiety; and SI participants reported a higher level of confidence in their abilities. The article concludes with identifying new avenues for investigation of the SI model, especially with a deeper understanding of student motivation.

Po, Y. K. (2004). *An evaluation of a Supplemental Instruction program.* (Master's of Arts thesis), University of Hong Kong, Hong Kong. www.hub.hku.hk/handle/10722/31605

Supplemental Instruction (SI) has been introduced at the University of Hong Kong. The focus for this masters' thesis was on the usefulness of SI with a business statistics course during 2004 and 2004. the study involved both a comparison of SI and non-SI participant grades as well as semi-structured interviews and observations to further evaluate the utility of SI. While there was no improvement in final course grades, interviews with the SI participants revealed the following themes: more opportunities to discuss the course, increased confidence in the subject matter, and reduced test anxiety.

Podolsky, T. (2017). Building leadership skills: A small cohort study of the associated benefits of being an SI leader. *Supplemental Instruction Journal, 3*(1), 6-23. www.info.umkc.edu/si/wp-content/uploads/2017/12/Compressed-siJ-Volume-Three-Issue-One.pdf.

Since the inception of Supplemental Instruction study groups in 1973, the benefits for student participants have been

thoroughly studied and reported. There have also been reports about the associated benefits that SI Leaders can acquire from being involved with the program as peer mentors; however, these claims remain primarily anecdotal, and there has been a minimal amount of research conducted on the actual nature of the benefits for SI facilitators (Couchman, 2009). This research project aims to discover the specific nature of the benefits to SI Leaders who have moved on to other academic programs or professional careers. The research was conducted by surveying 24 former SI Leaders and through two focus groups consisting of 5 former Leaders in total. The results indicate that the SI Leaders benefitted by improving their own study skills in a variety of ways, improving their communication skills, increasing their self-confidence when public speaking, developing both their appreciation of and their ability to work in group situations, increasing their capacity to be flexible and adaptable, and improving their teaching abilities. Although these skills are not necessarily taught or learned through typical course work, they are highly valuable in graduate and professional programs, and workplaces often covet employees who already have many of these “leadership” skills. By placing a greater focus on the leadership development aspects of SI programming, this research study provides concrete evidence that there are tangible benefits for SI Leaders themselves, which confirms the value of SI programming beyond the more established benefits for student participants.

Raica-Klotz, H., Montgomery, C., Giroux, C., Brinson, C., Gibson, Z., Singleton, T., . . . Vang, K. (2014). "Developing writers": The multiple identities of an embedded tutor in the developmental writing classroom. *Praxis: A Writing Center Journal, 12*(1), 21-26. http://hdl.handle.net/2152/62315.

In her essay “When Basic Writers Come to College,” Patricia Bizzell explains that writers placed in developmental courses “are asked to join an academic community ... united almost entirely by its language” (296). Specifically, students are asked to learn “new dialect and discourse conventions ... [and] the outcome of such learning is the acquisition of a whole new world view” (297), which requires not only a different way of writing and communicating but a different way of thinking. This is no small task. Therefore, some of the problems that developmental writers face “are best understood as stemming from the initial distance between their world views and the academic world view” (297). James Paul Gee further defines these communities as “Discourses” where students can create an “‘identity kit,’ which comes complete with the appropriate costume and instructions on how to act, talk, and often write, so as to take on a particular role that others will recognize” (7). Many of us would agree that most writing center tutors have successfully negotiated these different communities and Discourses, adapted alternative viewpoints, and even created various identities through their work in our centers, which results in tremendous change and growth. As Hughes, Gillespie, and Kail have demonstrated through the Peer Writing Tutor Alumni Research Project, the work of tutoring has a profound impact, changing the way tutors perceive writing, learn critical thinking, value the power of collaborative learning, and develop a new-found sense of personal confidence.

Rayford, T., Ruedas-Gracia, N., Goldstein, M. H., Schimpf, C., Hebert, L., escamilla, L., & Zayala, J. J. (2022). *Educational enrichment: The benefits of near-peer mentoring for undergraduate engineering students.* Conference Proceedings of the Excellence through Diversity ASEE Annual Conference, Minneapolis, MN. https://peer.asee.org/educational-enrichment-the-benefits-of-near-peer-mentoring-for-undergraduate-engineering-students.pdf

Near-peer mentoring is a common teaching practice where a senior learner guides a junior learner. The proximity of skills and experiences of near-peer mentors generate a deep level of relation and understanding of mentee needs, allowing mentors to provide effective learning strategies. This connection between mentor and mentee enhances mentee learning, confidence, and motivation. However, the benefits of near-peer mentoring for the mentors are less clear. To understand the benefits of near-peer mentoring for mentors, we collected data from near-peer mentors who participated in a Science Technology Engineering Art and Mathematics summer camp. The summer camp was a weeklong remote paper mechatronics camp designed for incoming seventh, eighth, and ninth grade students. Mechatronics is an interdisciplinary field that combine electronics, computation, and mechanics and thus provides a high ceiling for creative design. In contrast, paper mechatronics focuses on inexpensive paper components and craft parts to create a low barrier for student entry. The camp was grounded in culturally sustaining pedagogy to promote learning, identity development, and sense of belonging to STEM. It consisted of two key components: near-peer mentors and storytelling. Near-peer mentors were the primary facilitators for the students. The mentors were two undergraduate engineering students responsible for designing the project curriculum, testing, developing student support, and facilitating most of the sessions throughout the summer camp, with supervision from faculty members. The students created two machines, the Walking Jansen and the Up-and-Down Crank. Furthermore, student were encouraged to use their personal experiences and identities to tell stories through their projects. To assess the benefits of near-peer mentoring, we asked What did near-peer mentors gain from creating and facilitating the summer camp? We collected two forms of data to address the research question 1. Daily journals kept by the mentors during the camp, and 2. Semi-structured interviews. The analysis reveals considerable benefits for the mentors: Mentors developed

essential teaching skills, their belonging to STEM improved, and mentors practiced consolidation. The results highlight the extensive benefits of near-peer mentoring. Near-peer mentoring is a valuable enrichment opportunity to supplement undergraduate core engineering education.

Redl, T. (2020). Accelerating students successfully through developmental and college-level mathematics and embracing co-requisite models: An 8-week + 8-week model. *Journal of Education and Social Development, 4*(2), 17-21. www.ibii-us.org/Journals/JESD/V4N2/Publish/V4N2_4.pdf.

We describe the framework, supports, successes, challenges, goals, and next steps for a Texas four-year public university's accelerated and co-requisite 8-week + 8-week course model for developmental mathematics students. Through this model, these students can successfully complete both their developmental mathematics and subsequent college-level core mathematics course in the same 16- week semester. The university's award-winning Supplemental Instruction (SI) Program, Center for Mathematics and Statistics Support tutoring lab, and the Gator Success Center all play a major role in supporting this model and contributing to student success. The model also contributes to the goals of the Texas Higher Education Strategic Plan (60x30TX) and is compliant with Texas HB 2223, which requires all Texas institutions of higher education to design and implement co-requisite models for its developmental students. Enhancement of this model, along with essential supports such as monitoring, mentoring, advising, counseling, and tutoring, has enabled the university to continue to provide its first-time-in-college (FTIC) developmental student population with confidence to earn credits in college-level courses and graduate more quickly and with marketable skills-based degrees, as well as contribute to the university's FTIC retention and 6-year graduation rates.

Reid, A. G. (2016). *Understanding the underrepresented minority experience in undergraduate calculus courses.* (Ph.D. dissertation), University of Delaware.

The purpose of the study was to investigate the experiences of underrepresented minority (URM) students enrolled in calculus courses at the University of Delaware. Coupling qualitative research methodology with critical race theory and social cognitive theory, the researcher chronicled the experiences of seven students negotiating the achievement gap in mathematics at this primarily white institution. The study allowed the students to explore their perceptions of access to mathematics, academic achievement in mathematics, and the effect of race and/or racism on their performance in college mathematics. While the national trend shows that underrepresented students earn lower overall grade point averages than their nonunderrepresented counterparts, there is little specific information about their performance and experience in these courses (Nettles et al., 1986). A survey conducted by Treisman (1992) found that there are four widely held beliefs about the causes of minority (underrepresented) student failure in college calculus: low motivation, poor academic preparation, lack of family support, and low family income. Research by Bressoud, Carlson, Mesa, & Rasmussen (2013) indicates that students at research institutions offering Calculus I courses are least likely to maintain student confidence in their mathematical abilities, enjoyment of mathematics, and interest in continuing in the mathematics needed to pursue their intended careers. In order to capture the perspectives of underrepresented students taking calculus courses, interviews were conducted with participants targeted through an electronic survey instrument. Data analysis was performed through narrative inquiry, using the interview transcripts through a number of lenses such as stories simultaneously situated within a particular context and within a wider cultural context. Subsequently, analysis of the data indicated that students desire a number of changes within the curriculum, pedagogy, and calculus sequence, including more one-on-one interaction with the course instructor, as well as more collaborative work in the classroom. While microaggressions were also explored in these settings, they were shown not to have a significant impact on the success of the targeted participants.

Rodriguez, N., Cruz, A., Sardinas, S., & Ramon, A. (2016). *Peer leaders' perceptions of learning experiences*. Paper presented at the 2016 Conference for Undergraduate Research at Florida International University, FL. www.digitalcommons.fiu.edu/cgi/viewcontent.cgi?article=1057&context=fiu-undergraduate-research-confere nce.

Peer-Led Team Learning (PLTL) at Florida International University maintains a large volume of student and Peer Leader (PL) participation. Students, who participate in PLTL, on average, perform a letter grade better than their peers who do not participate in PLTL. To analyze PL perspectives on learning, a survey was conducted. The survey had a series of Likert scale statements and free response questions on learning. The nature of the questions are regarding barriers in education, individual learning strengths and weaknesses, and the perception that PLTL improved the learner's capabilities to overcome these obstacles. Based on the survey responses, PLs perceive an improvement in the way they learn during and/or after becoming a PL. Students participating in PLTL exhibited an increase in course content retention and perceived improvement in study skills. Students in PLTL also perceived the PLTL workshop environment to be comfortable enough to address questions and misconceptions.

Romito, L., Daulton, B. J., Stone, C., & Pfeifle, A. L. (2020). Peer-Led Team Learning in a foundational IPE curriculum. *Health, Interprofessional Practice and Education, 4*(1). doi: www.org/10.7710/2641-1148.2126. www.scholarworks.iupui.edu/bitstream/handle/1805/27551/Romito2020Peer-CCBY.pdf?sequence=1&isAllowed=y.

The Peer Led Team Learning (PLTL) instructional model utilizes Peer Leaders, advanced students who mentor and guide student teams to collaborate on applied course concepts. PURPOSE To apply a modified PLTL model in the university's foundational, longitudinal, competency-based interprofessional education (IPE) curriculum. METHODS Twelve Peer Leaders were selected, trained, and deployed as facilitators for interprofessional teams of students during the IPE curriculum's first three large-scale learning events. Peer Leaders completed an evaluation of training, a facilitation skills survey, and participated in a semi-structured focus group interview process. RESULTS After participating in the PLTL program, Peer Leaders reported increased confidence in their interprofessional knowledge and facilitation skills. The primary challenge for Peer Leaders in facilitating teams was lack of student engagement (n=7, 58%). CONCLUSION PLTL is a feasible model for IPE settings. It has the potential to both increase facilitator capacity in interprofessional learning activities and have a positive impact on Peer Leaders.

Saunders, D., & Gibbon, M. (1998). Peer tutoring and peer-assisted student support: Five models within a new university. *Mentoring & Tutoring, 5*(3), 3-13.

This article describes the use of Supplemental Instruction (SI) -- called Peer Assisted Student Support (PASS) by the local institution -- in the Business School at the University of Glamorgan in Glamorgan, Wales, United Kingdom. SI has been offered in the School of Applied Sciences since 1991. It is called PASS within the Business School. Most of the PASS group facilitators are volunteers and have previously been participants in groups when they were first year students. Positive reports from facilitators included: satisfaction gained from being able to positively help their peers, improved self-confidence, better communication and oral presentation skills as a result of running sessions, and being able to strengthen their job resume. The author identified several challenges with the PASS scheme: student attendance was erratic due to perceived time conflicts of students; difficulty to maintain the voluntary program as committed PASS facilitators graduated and new leaders needed to be recruited to take over responsibilities.

Saunders, P., Chester, A., & Xenos, S. (2020). University student peer tutoring: A pilot program to improve learning bor both tutors and tutees *Championing cutting-edge 21st century mentoring and learning models and approaches, Volume 4* (pp. 27-44): Brill

Student peer tutoring provides an evidence-based approach to improve learning, satisfaction and retention of first year students in a range of disciplines. It has also been reported to impact positively on later year peer tutors. In this chapter we describe a number of models of student peer tutoring including Class Wide Peer Tutoring, Supplemental Instruction and Peer Assisted Study Sessions (PASS). Against this backdrop we present data from a pilot program developed to support the transition of first year undergraduate psychology students. Using second year peer tutors, this program used small peer tutoring groups embedded in tutorials. With a focus on assessment tasks the program evidenced a positive impact on academic performance in early assessment tasks as well as improved academic confidence and retention for the first year participants. The quantitative results of this experimental study are presented alongside qualitative data from both first year students and their later-year peer tutors to examine the strengths as well as areas for improvement of the program.

Scriver, S., Olesen, A. W., & Clifford, E. (2015). From students to leaders: evaluating the impact on academic performance, satisfaction and student empowerment of a pilot PAL programme among first year students and second year leaders. *Journal of Learning Development in Higher Education: Special Edition: Academic Peer Learning*(November). www.aldinhe.ac.uk/ojs/index.php?journal=jldhe&page=article&op=view&path%5B%5D=359&path%5B%5D=pdf.

This paper evaluates the pilot year of the CÉIM PAL initiative at the National University of Ireland Galway through analysis of examination results, student surveys and the reflections of two students who participated as first year students in the pilot year and subsequently as student leaders in year two. The paper considers the impact of attendance at sessions on academic performance, student satisfaction with the programme, and evaluates the extent to which the initiative has assisted students to become more empowered learners as expressed through the development of self-directed learning, growth in educational self-efficacy, and confidence in navigating the learning environment. Recommendations are also made for developing the CÉIM initiative, which may be relevant to other PAL programmes and for determining the direction of future research.

Sletvold, H., Loftffell, A. L. G., Lervik, M., Suzen, E., Helde, R., & Amundstuen, L. (2021). Supplemental Instruction implementation in healthcare education. In A. Strømmen-Bakhtiar, R. Helde & E. Suzen (Eds.), *Supplemental Instruction: Organisation and leadership, volume 3* (pp. 85-100). Munster and New York: Waxmann. www.www.waxmann.com/index.php?eID=download&buchnr=4326.

Within pharmacy or nursing education, the literature on the implementation and evaluation of Supplemental Instruction (SI) is limited. The objective of this study was to describe the experiences of an SI pilot in two first-year courses in pharmacy and nursing education, and to evaluate the impact of the SI model on SI leaders and students. A case study was performed on the development and structure of an SI pilot programme, and qualitative analysis was used in the evaluation. Students and SI leaders were concerned about not receiving or providing answers to questions in SI sessions, respectively. However, various helpful learning strategies were used in the sessions. The organisation of the SI programme was challenging and required continuous attention and evaluation. Positive outcomes for both students and SI leaders included improved self-confidence, socialisation, knowledge of learning strategies, and communication skills. Students were motivated to study, and SI participation was relevant to exams. SI leaders gained increased management, teamwork development, and discussion facilitation skills. We conclude that care must be taken when implementing peer-assisted learning interventions, and this study provides valuable insights into adapting SI as a pedagogical model in healthcare education. This work lays the foundation for the further development and utilisation of the SI programme in healthcare education.

Smith, L. D. (1999). *SI leadership and personal growth: A South African perspective.* Conference Proceedings of the First National Conference on Supplemental Instruction and Video-based Supplemental Instruction, Kansas City, MO.

Many first year students at South African tertiary institutions come from a disadvantaged educational background. They tend to be passive learners and rely on rote memorization rather than understanding. This leaves many ill equipped for the demands of higher education. Although Supplemental Instruction (SI) provides academic support, its emphasis on students' identifying problems, finding answers and taking responsibility for their learning requires a significant change in approach for both participants and the SI leader. This study documents the benefits of working as an SI leader. Initial attitudes are compared with those developed in the course of a year, by mans of a questionnaire covering self-confidence, self-efficacy, identification with institution, class participation and relationship with lecturers. The personal growth of SI leaders is also compared with that of a group of non-SI cohorts. Employers' perceptions of the responsibility, initiative, creativity and reliability of SI and non-SI graduates are documented.

Soysal, D., Bani-Yaghoub, M., & Riggers-Piehl, T. A. (2022). Analysis of anxiety, motivation, and confidence of STEM students during the COVID-19 pandemic. *International Electronic Journal of Mathematics Education, 17*(2). http://files.eric.ed.gov/fulltext/EJ1336125.pdf.

The current COVID-19 pandemic has largely impacted the academic performance of several college students. The present study is concerned with the effects of the COVID-19 pandemic on students pursuing a STEM (science, technology, engineering, and mathematics) degree. We collected weekly survey data (w=9) of students (n=53) taking calculus courses during the COVID-19 pandemic. Using the self-reported survey data, we investigated the temporal variations in the levels of anxiety, motivation, and confidence of STEM students. Studies on temporal changes to math anxiety are scarce. The present work aims to fill this gap by analyzing longitudinal survey data associated with math anxiety. Furthermore, using descriptive and inferential statistical methods such as one-way ANOVA, we analyzed the data with respect to gender and academic level. Our results indicated that male and freshman/sophomore (F/Sp) STEM students had higher levels of increased anxiety due to COVID-19. Female and F/Sp STEM students had higher levels of motivation, whereas junior/senior (J/S) and male students exhibited higher levels of confidence. Time series analysis of the data indicated that the levels of motivation and confidence significantly dropped toward the end of the semester, whereas the level of anxiety increased in all groups. Also, the use of math resources (such as tutoring and supplemental instruction) has significantly reduced during the COVID-19 pandemic.

Spangler, S., & Shah, K. (2022). Students' perception of assurance, utilization of a pilot program: Synchronized online discussions. *Issues in Information Systems, 23*(4), 111-118.

The IRB-approved research focuses on information technology students' (n=23) perceptions of comfort, confidence, and utilization of the pilot program to understand its value. The study questions the usefulness of academic instructors in higher education at a Southeastern Atlantic University's model to employ online synchronized lectures in LMS systems. The goal of the program focused on reducing anxieties and distance separation from online learners. The researchers' observations cannot be generalized to state that synchronized virtual appearances create an increase or propensity for online student retention. However, the research highlights positive student perceptions of comfort, confidence, and utilization of the program, like the use of embedded librarian program. Additionally, the findings indicate parallel considerations of students' perceptions of

embedded programs and suggest limited notes of perceived greater levels of self-efficacy. Furthering, the researchers disclose a larger need for a cross-generational quantitative study and note the geographical limitations, socio-economic constraints, and technology gaps limitations create the inability to generalize the study to a larger population.

Spangler, S. C., Shah, K. K., & Lockwood, W. E. (2022). *Embedded tutors in online IT courses: Perceptions of students' comfort, confidence, and utilization of a pilot program.* Conference Proceedings of the EDSIG Conference, Clearwater, FL. https://proc.iscap.info/2022/pdf/5729.pdf

The pilot study reflects perceptions from higher education students in an experimental new online teaching program at a mid-sized Southeastern United States University. The research focused on the effectiveness of an embedded tutoring pilot program in online and hybrid learning management systems (LMS). The research was focused on information technology students' (n=46) perceptions of comfort, confidence, and utilization of the pilot program to understand its value in student retention. The research notes student comfort, confidence, and utilization of the program. Additionally, it supports the notion that the program can construct student retention aspects by reducing anxieties and stress from distance learning spatial inconsistencies. The findings suggest similar results or parallel considerations of students' perceptions in the literature on embedded librarian programs. However, the results fail to mirror students receiving more significant levels of self-efficacy.

Spencer, C., & Loh, H. (1994). *Improving the learning style of first year Aboriginal & Torres Strait Islander nursing students studying anatomy*. Unpublished manuscript. Conference of Science in Nurse Education. Ballarat, Australia.

This report describes the use in 1994 of Supplemental Instruction (SI) at Queensland University of Technology (Australia) with first year Aboriginal and Torres Strait Islander (A&TSI) students. The local institutional name for the program is Peer Assisted Study Sessions (PASS). Many of these A&TSI students began postsecondary education with high anxiety (79% student response), low to medium confidence in passing their courses, limited knowledge of study skills, and high to moderate difficulty levels within their respective subjects. Based on qualitative research interviews with the A&TSI students, the majority reported they were more confident in passing anatomy after attending the SI sessions. Further, they reported that they were more motivated to perform better and most felt that the SI sessions helped them in developing study skills as their anxiety for the subject decreased.

Staff. (1993). Academic programme at Queensland University of Technology well supported. *The Chinese Business and Professional Association of Queensland Newsletter*, 20-21.

This newsletter article describes the use of Peer Assisted Study Strategies (PASS) at Queensland University of Technology (Brisbane, Queensland, Australia). PASS is the local institutional name for Supplemental Instruction (SI). The article cites the PASS program as one of the projects that contributed to QUT being selected as Australia's University of the Year in 1993. Benefits reported for PASS participants include reduction of the failure rate and increased student motivation and confidence. PASS leaders listed the following benefits for them: developed personal character and leadership skills, improving their own learning skills, improved their facilitating techniques, acquired group management and presentation skills, and built their self-confidence and self-esteem. Ron Gardiner and Henry Loh are cited as the early leaders of the PASS project.

Staff. (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., & Hayes, H. (2006). Supplemental Instruction: Student perspectives in the 21st century. In D. B. Lundell, J. L. Higbee & I. M. Duranczyk (Eds.), *Student standpoints about access programs in higher education* (pp. 129-141). Minneapolis, MN: Center for Developmental Education and Urban Literacy, University of Minnesota. www.education.umn.edu/CRDEUL/publications.html.

This qualitative study was conducted with Supplemental Instruction (SI) participants at the University of Missouri-Kansas City. Themes that emerged regarding the positive benefits of SI included: better organization of course material, reinforcement of major concepts, clarification of questions asked

identification of key concepts, learning in a "safe" environment, opportunity to voice understanding., exposure to other perspectives, deeper understanding, and increased confidence. Several themes emerged regarding challenges with the SI model. These included: unproductive SI sessions, SI leaders did not reteach the course material, sometimes received contradictory or confusing information, and some expressed dissatisfaction with peer cooperative learning. SI leaders were also a part of the qualitative study. Themes that emerged included: leadership development, study strategy development, opportunity to teach, deeper content knowledge, and development of relationships.

Stout, M. L., & McDaniel, A. J. (2006). Benefits to Supplemental Instruction leaders. In M. E. Stone & G. Jacobs (Eds.), *Supplemental Instruction: New visions for empowering student learning* (pp. 55-62). New Directions for Teaching and Learning, No. 106. San Francisco: Jossey-Bass

This chapter explores the many benefits that accrue to Supplemental instruction (SI) leaders as a result of their participation: academic competency, improved communication and relationship-building skills, enhanced personal development such as higher self-confidence and self-esteem, and enhanced professional development such as leadership skills, teamwork strategies, verbal and written expression, and self-assurance.

Szeto, W. M., Li, K. M., Wu, V. J., Wong, I. K. T., Cheng, A. H. W., & Leung, M. Y. (2022). A student perspective on the effectiveness of PASS in seminar courses: A mixed-method study. *Journal of Peer Learning, 15*, 48-65. https://ro.uow.edu.au/ajpl/vol15/iss1/5/.

The General Education Foundation (GEF) Programme, consisting of two seminar courses, namely “In Dialogue with Humanity” and “In Dialogue with Nature,” has been a common core requirement of The Chinese University of Hong Kong since 2012. Aided by selected classics, students from all faculties engage in dialogues with their teachers and each other to reflect on what it means to have a good life, what an ideal society is, and the nature of intellectual pursuit in the sciences. Reading classics and discussing serious questions in class, however, can be challenging for some students. To help students meet these challenges, Peer Assisted Study Sessions (PASS) were introduced in the pilot stage of GEF in 2010 and, with subsequent refinements, continue to this day. The seminar-style and interdisciplinary nature of GEF makes it an atypical case for PASS. This paper will examine and evaluate how PASS can improve student learning in seminar-style courses like GEF with a mixed-method study from a student perspective. According to evidence from online surveys and focus group interviews, PASS successfully 1) improves students’ understanding of the course content at a cognitive level, 2) assists and motivates them to prepare better for seminar discussions, effecting a behavioural change, and 3) facilitates affective learning outcomes in terms of confidence and motivation. Major challenges—including students’ misperceptions about PASS, differences in leaders’ approaches and organisational difficulties—are identified. Proposed solutions to these challenges will also be discussed.

Thiry, H., Hug, S., & Barker, L. (2008). *CAHSI Year 2 annual evaluation report: Recruiting, retaining, and advancing Hispanics in computing*. University of Colorado. Bolder, Colorado. www.colorado.edu/eer/downloads/CAHSIyear2Report2008.pdf

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

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

Thompson, M. (2015). *The effect of Learning Assistants on student learning outcomes and satisfaction in large science and engineering courses.* Conference Proceedings of the National Association for Research in Science Teaching, Chicago, IL. https://www.researchgate.net/profile/Meredith-Thompson/publication/275032656_The_effect_of_Learning_Assistants_on_student_learning_outcomes_and_satisfaction_in_large_science_and_engineering_courses/links/552fda480cf2f2a588aabad8/The-effect-of-Learning-Assistants-on-student-learning-outcomes-and-satisfaction-in-large-science-and-engineering-courses.pdf

This mixed method study investigates the effect of incorporating undergraduate students who have recently taken a course, or Learning Assistants (LAs), on the satisfaction and learning outcomes of students in large, introductory science and engineering courses at Boston University. Quantitative data were gathered through a survey of over 600 students in five large science and engineering courses exploring how student background, study strategies, and course experiences influence students' satisfaction and final course grade. The quantitative model shows that students who prefer to study in groups tend to be positive about the LAs and the small group sessions in which these students work, but are less satisfied with the course and tend to have slightly lower final course grades than students who do not use group work as a study strategy outside of class. The qualitative results show that students in these courses prioritize doing well in the course, especially on the individually based exams. In contrast, the LAs emphasize learning for understanding and working in collaborative groups. Despite the dichotomy between the students' orientation towards grades and the near peers' emphasis on learning, the students in the courses are very satisfied with the LAs. In addition to helping students with course content, LAs help students build confidence in their ability to succeed, and provide a valuable link to the university community.

Tran, C., Hartmann, K., Olsker, T. C., & Bonsangue, M. (2016). The impact of Supplemental Instruction on the SI leader. *Supplemental Instruction Journal, 2*(1), 6-18. www.info.umkc.edu/si/wp-content/uploads/2016/09/siJ-Volume-Two-Issue-One.pdf.

This study conducted at California State University, Fullerton, examined the impact of SI upon the leaders. Variables included sex, first generation status, and underrepresented minority group status. Men increased incresed confidence and communication effectiveness at higher rates than women. The underrepresented group reported higher ability to handle student conflict and communicate with peer than majority students.

Tran, K., Barrera, A. M., Coble, K., Arreguin, M., Harris, M., Macha-Lopez, A., . . . Eroy-Reveles, A. (2022). Cultivating cultural capitals in introductory algebra-based physics through reflective journaling. *Physical Review Physics Education Research, 18*. doi: https://doi.org/10.1103/PhysRevPhysEducRes.18.020139. https://journals.aps.org/prper/pdf/10.1103/PhysRevPhysEducRes.18.020139.

At a large, diverse, hispanic-serving, master's-granting university, the Alma Project was created to support the rich connections of life experiences of science, technology, engineering, and mathematics (STEM) students that come from racially diverse backgrounds through reflective journaling. Utilizing frameworks in ethnic studies and social psychology, the Alma Project aims to make learning STEM inclusive by affirming the intersectional identities and cultural wealth that students bring into STEM classrooms. Approximately once

per month students who participate in the Alma Project spend 5–10 min at the beginning of class responding to questions designed to affirm their values and purpose for studying STEM in college. Students then spend time in class sharing their responses with their peers, to the extent that they feel comfortable, including common struggles and successes in navigating through college and STEM spaces. For this study, we analyze 180 reflective journaling essays of students enrolled in General Physics I, an algebra-based introductory physics course primarily for life science majors. Students were enrolled in a required lab, a self-selected community-based learning program (Supplemental Instruction), or in a small number of instances, both. Using the community cultural wealth framework to anchor our analysis, we identified 11 cultural capitals that students often expressed within these physics spaces. Students in both populations frequently expressed aspirational, attainment, and navigational capital, while expressions of other cultural capitals, such as social capital, differ in the two populations. Our findings suggest that students bring rich and diverse perspectives into physics classrooms when asked to reflect about their lived experiences. Moreover, our study provides evidence that reflective journaling can be used as an asset-based teaching tool. By using reflective journaling in physics spaces, recognizing students' assets has the potential for physics educators to leverage students' lived experiences, goals, and values to make physics learning more meaningful and engaging.

Utschig, T. t., & Sweat, M. (2008). *Implementing Peer Led Team Learning in first-year programming courses.* Conference Proceedings of the Frontiers in Education Conference, 2008. FIE 2008. 38th Annual, Saratoga Springs, NY.

In the Peer Led Team Learning model (PLTL) many of the skills developed by students correlate well with desired learning outcomes in CSET programs. The authors report the results of a project to implement PLTL in introductory programming courses. An overview of the implementation model is provided, lessons learned are reported, and the assessment process and results are described. The research questions explored are: (1) What is the impact of the PLTL model on student skills and confidence regarding teamwork, leadership and communication? (2) How effective is PLTL in terms of building problem-solving skills in introductory programming? This project involved a pilot implementation followed by full implementation in the following year. Student peer leader surveys, along with a peer leader focus group, were used to analyze project impact and to plan for improvement in achieving the learning outcomes described above. Results indicate that students are satisfied with the peer led team learning model and that significant skill enhancement is occurring. In particular, a significant fraction of peer leaders in the second year of implementation came from those participating in the pilot.

Vasquez, S. (2000). How to structure a Supplemental Instruction session: Daily agendas and semester goals. *NCLCA Newsletter*, 8-8.

Supplemental Instruction (SI) programs typically employ undergraduate students to serve as SI leaders. Sometimes their inexperience leads to less productive SI sessions for the participants. Adding structure to the SI sessions can assist novice SI leaders until they gain experience and confidence to respond more quickly to needs presented by students attending the SI sessions. A suggested agenda is: identify common questions of the students; engage students in a preplanned collaborative learning activity; focus on the most important concepts covered in the class lecture and textbook; and answer questions that have not been answered by the aforementioned Si session activities.

Villatoro, M. L., Moreira, M., & Liang, Y. (2012). *Successful implementation of PLTL for the Department of Construction Management and Civil Engineering Technology (CMCE) of New York City College of Technology* Conference Proceedings of the Peer-led Team Learning International Society Inaugural Conference, Brooklyn, NY. www.pltlis.org/wp-content/uploads/2012%20Proceedings/Villatoro-2012.docx

Peer Led Team Learning (PLTL) involves students working in small groups under the guidance of a Peer leader. Peer Leaders are current students who have successfully completed the course. The goal of PLTL is to enable students to gain confidence and critical problem solving skills that will help them master the course content thereby improving their ability to succeed in successive design courses. PLTL is currently in its first semester of implementation and data indicates that the students in the PLTL inclusive Statics classes are performing better than those in sections without PLTL.

Wallace, J. (1992). Students helping students to learn. *The New Academic, 1*(2), 8-9.

This article describes the use of Supplemental Instruction (SI) at Kingston University in London, England. In addition to reports of improved academic performance by SI participants, interviews with SI leaders suggest they had the following results: higher final course grades in other subjects, increased leadership skills, higher confidence levels, and increased contact with faculty members.

Wallace, J. (Writer). (1996). Supplemental Instruction: The challenging way forward [Videotape]. In G. Mair

(Producer). Glasgow, Scotland: Glasgow Caledonia University
This videotape provides an overview of the implementation of Supplemental Instruction (SI) in the United Kingdom. It contains an interview with two SI leaders (Paul Irwin and Mel Dobie) concerning benefits of the SI program to the SI leaders: increased leadership skills, improved use of study strategies, higher confidence level, and increased content knowledge.

Wallace, J. (Writer). (1996). Supplemental Instruction: A profile of the scheme [Videotape]. In G. Mair (Producer). Glasgow, Scotland: Glasgow Caledonia University
This videotape provides an overview of the implementation of Supplemental Instruction (SI) in the United Kingdom. Jenni Wallace, Certified Trainer for the United Kingdom, provides a historic perspective of SI's use in the United Kingdom. Following is an interview with two SI leaders (Paul Irwin and Mel Dobie) concerning benefits of the SI program to the SI leaders: increased leadership skills, improved use of study strategies, higher confidence level, and increased content knowledge.

Warner, J. M. (2008). *Supplemental Instruction for non-science majors biology students: Meanings and influences on science identities for women.* (Ph.D. dissertation), University of North Carolina at Greensboro, Greensboro, NC.
The purpose of this study was to examine the meanings women make of their participation in a Supplemental Instruction (SI) program associated with a postsecondary non-majors biology course. Interview and survey data were utilized to determine why women attended SI, the affordances provided by regular SI participation, how women depicted the learning environment of SI, and how women described science as they experienced it in SI. Additional interviews were conducted with a sub-population of participants who regularly utilized SI to provide an understanding of the role SI participation played in terms of access to science identities for women who changed their majors, minors, or concentration within an education major to biology as a result of their experiences in non-majors biology and SI. The results of this study suggest that the SI experience provides more than just a means to increase grades for women who participate regularly. The supportive and safe climate of the SI environment set a comfort level for women that increased their competence and confidence in biology. The SI experience increased interest in biology and afforded the opportunity for women to be recognized by others, and to recognize themselves, for their science abilities. Additionally, for a small number of women, their experiences in non-majors biology and SI facilitated a shift in science identities that led the women to immigrate into science

Watters, J. J., & Ginns, I. S. (1997). *Peer assisted learning: Impact on self-efficacy and achievement*. pages. Paper presented at the American Educational Research Association Conference, March 24-28, 1997, Chicago, IL.
This paper describes the use of program modeled after Supplemental Instruction (SI) in a teacher education course at Queensland University of Technology (Brisbane, Australia). The institutional name for the program is Peer Assisted Study Sessions (PASS). The class had 124 students enrolled in a course designed for first-year Bachelor of Education students. Program outcomes were that SI participants earned higher final course grades (4.88 vs. 4.15 on a scale of 0 to 7) and self-reported development regarding confidence and improved attitudes to learning and science. There was a trend for higher grade achievement with higher levels of attendance at the SI sessions. The SI leaders reported improved confidence, facilitator skills, and insight into adult education.

Webster, k., & Hansen, J. (2014). Vast potential, uneven results: Unraveling the factors that influence course-embedded tutoring success. *Praxis: A Writing Center Journal, 12*(1), 51-56. http://hdl.handle.net/2152/62378.
At the University of Montana Writing Center, we enter each semester encouraged by the promise of academic renewal: another chance to make our writing center a gathering ground for positive change. As writing center administrators, we also begin the semester uncomfortably aware of past less-thansuccessful institutional collaborations, and we look forward, determined to try again. Ideally, our collaborations should allow for the “possibility of mutual learning” and “a pedagogy of becoming” (Geller et. al 59), leaving room for students, tutors, and faculty to reach new insights and question old assumptions.

White, B. (1996). The student peer mentor program in its trial year: A mentor's perspective. *Queensland University of Technology Law Journal, 12*(1), 221-228.
In 1994 the Student Peer Mentor program was piloted in the Bachelor of Laws program of study (two individual classes: Torts and Law of Contract) at Queensland University of Technology in Australia. The program was based upon Supplemental Instruction (SI). This article describes the program from the perspective of one of the student mentors. Strengths of the program included: less private time needed to study; non-threatening environment; identified academic skills needed for success; and expanded social circles. Benefits of the program for the mentors included: improved interpersonal communication skills; increased content

comprehension; provided personal satisfaction of helping others; and improved confidence in leadership and group situations.

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.

Wilkinson, J., & Brent, G. (2019). Peer Assisted Study Sessions (PASS): Recognizing employability through PebblePad *Blended learning designs in STEM higher education* (pp. 139-149): Springer

Peer Assisted Study Sessions (PASS) is a voluntary, weekly, academic assistance program utilizing peer-led group study to help students succeed in traditionally difficult subjects. PASS provides opportunities for students to strengthen their knowledge by being actively involved in group learning that is focused on identifying and reviewing key lecture content, testing understanding of difficult concepts, gaining confidence through discussing complex course material, and engaging in cooperative problem-solving methods. The sessions are facilitated by students who have completed at least one year of study, have excelled in the course, maintained a strong Grade Point Average and have completed a two-day intensive PASS Leader training course. Through planning, leading, and organizing sessions, leaders develop strong transferable attributes including interpersonal communication skills, listening skills, time management and organizational skills, leadership and team working skills, equipping them for professional life beyond university. Leaders are observed at least twice per trimester, by the PASS Coordinator and by a Senior Leader, with feedback provided to support development. Using an observation template on PebblePad ensures that comments can be easily reviewed before observations and leaders receive timely feedback that is stored in an accessible format, providing evidence of contribution and skills. Leaders also use PebblePad to reflect on their experience of the PASS Program and transferable skills developed, allowing them to identify, document, and evidence key employability skills and attributes.

Williams, J. L., Miller, M. E., Avitabile, B. C., Burrow, D. L., Schmittou, A. N., Mann, M. K., & Hiatt, L. A. (2017). Teaching students to be instrumental in analysis: Peer-Led Team Learning in the instrumental laboratory. *Journal of Chemical Education, 94*(12), 1889-1895. doi: 10.1021/acs.jchemed.7b00285.

Many instrumental analysis students develop limited skills as the course rushes through different instruments to ensure familiarity with as many methodologies as possible. This broad coverage comes at the expense of superficiality of learning and a lack of student confidence and engagement. To mitigate these issues, a peer-led team learning model was developed to give each student in-depth experiences operating and troubleshooting six common instruments. Electronic cigarette solutions were chosen for all work because of their current relevance. Small groups became “class experts” on their assigned instrument. Students were responsible for teaching their peers how to utilize their instrument for experimentation. Each student rotated through their peer’s instruments, learned to apply the knowledge they gained from one instrument to others, while they answered questions from peers. The students developed troubleshooting and communication skills—foundational tools for chemists. This model proved successful in promoting cognitive flexibility and critical thinking about experimental design, as reflected by oral quizzes and peer teaching. This adaptation of peer-led team learning helped engage students, promote confidence, and facilitate a deeper understanding of instrumentation.

Woods, D. R. (2014). Problem-oriented learning, problem-based lerning, problem-based synthesis, process oriented guided inquiry learning, Peer-Led Team Learning, model-eliciting activities, and project-based learning: What is best for you? *Industrial & Engineering Chemistry Research, 53*(13), 5337-5354. doi: 10.1021/ie401202k.

The educational contributions of David Himmelblau and Gary Powers are extended by describing a broad spectrum of learning environments that start with a problem. Many of these are characterized in the literature as being simply problem-based learning (PBL) or claiming to be similar to PBL (for example, process oriented guided inquiry learning, model-eliciting activities, project-based synthesis). In this paper, the different outcomes from the learning environment and the degree to which students are empowered with the learning process are criteria used to help identify the subtle differences of the options in 33 learning environments. Elaborations

and examples are given for 23 of these. Options for assessment are cited. Brief suggestions are given about how to select an effective learning environment with which you are comfortable.

Yates, J., Gill, F., & Webb, C. (1995). *Peer mentoring to facilitate learning in economics.* Conference Proceedings of the Australian Economics Education Symposium, Adelaide, South Australia, Australia.

This paper describes and provides a preliminary evaluation of Supplemental Instruction (SI) used at the University of Sydney (Australia) in an economics course during 1995. Three quarters of the SI leaders listed the following benefits of involvement with the program: improved teaching skills; improved leadership skills; increased confidence; and/or a change in the way they thought about economics.

Zaritsky, J. S. (1994). *Supplemental Instruction: A peer tutoring program at La Guardia Community College*. Unpublished manuscript. La Guardia Community College. Long Island City, NY. ERIC database. (ED373859).

This report describes the use of Supplemental Instruction (SI) at La Guardia Community College (NY). In spring 1993, an SI program was pilot tested in Principles of Accounting I, Introduction to Economics I and Fundamentals of Human Biology I courses. In Economics I the SI participants received a higher percent of A, B, and C final course grades (37% vs. 27%) and a lower rate of D, F, and course withdrawals (63% vs. 73%). In Economics I the SI participants received a higher percent of A, B and C final course grades (51.7% vs. 43.6%) and a lower rate of D, F and course withdrawals (48.3% vs. 56.4%). In Human Biology I the SI participants received a higher rate of A, B, and C final course grades (63.2% vs. 48.3%) and a lower rate of D, F, and course withdrawals (36.7% vs. 51.7%). Some SI leaders reported personal improvement in the following areas: higher self-confidence since they helped other students to do better; increased content knowledge through second review of the course; improved interpersonal communication skills; accelerated emotional and intellectual growth.

Zaritsky, J. S., & Toce, A. (2006). The basic SI model. In M. E. Stone & G. Jacobs (Eds.), *Supplemental Instruction: New visions for empowering student learning* (pp. 23-32). New Directions for Teaching and Learning, No. 106. San Francisco: Jossey-Bass

This chapter describes how SI has since 1993 been successful in improving grades and reducing failure in high-risk courses at LaGuardia Community College, an urban institution.In addition, the SI experience has benefits for the SI leaders: better understanding of the course material, discovering the joy of learning and helping others, gaining self confidence, strengthen communication and leadership skills.

Zulu, C. (2003). A pilot study of Supplemental Instruction for at-risk students at an Historically Black University (HBU) in South Africa. *Association Internationals de Linguistique Appliqu Review, 16*(1), 52-61.

This article discusses a pilot study during 2002 that sought to evaluate the effectiveness of Supplemental Instruction (SI) at the University of North-West, an historically black university in South Africa. The course under investigation was "Introduction to South African Legal Method and Theory" which first-year law students enrolled. Two questions were investigated: does SI have an effect on students' mastery of content? and does SI have an effect on students' perceptions of their mastery of skills? Three measures were used to evaluate SIL pre and posttests of content knowledge, student perceptions, and final course grades. There was a correlation of higher SI attendance and higher final course grades. The study also revealed barriers and challenges that students experience at the institution. Si was most effective for students who were better prepared academically and for whom English was their first language. These students had more capacity to engage in the SI sessions and gain the most benefit. The author also noted the disadvantage of voluntary SI attendance. Often the students who most needed to be there chose not to attend due to self-reported reluctance to expose their weakness and discomfort due to lacking the skills of the most prepared students. The author recommends that SI attendance be made voluntary and that SI be combined with other academic interventions such as Accelerated Learning Groups developed by Dr. Sydney Stansbury.