

Abraham, N., & Telang, N. K. (2021). *Cohort-based Supplemental Instruction sessions as a holistic retention approach in a first-year engineering course*. Conference Proceedings of the 2021 ASEE Virtual Annual Conference. www.strategy.asee.org/36803

This research paper examines the quantitative and qualitative impact of intentionally creating small, registration-based cohorts to regularly attend Supplemental Instruction (SI) sessions, implemented at our university in a first year engineering course in fall 2020. The SI program is an academic support program created in 1973 at the University of Missouri in Kansas City, to improve grades in traditionally "difficult" classes, promote student retention and increase graduation rates. The historically successful and evidence-based SI program was introduced at this university in 2015 through a collaboration between the School of Engineering and the campus Learning Center. The supported courses include freshman level introductory courses to Electrical Engineering and Computing. These are required courses for the Electrical and Computer engineering students at the university, and report high percentages of D's, F's, Q's (drops), and W's (withdraws). To improve academic success, traditional SI programs provide voluntary, non-remedial weekly sessions designed to combine application of difficult content via opportunities for additional practice and collaborative activities that require active engagement of students and use of transferable study effectiveness skills. The SI model was built upon theories including the social interdependence and mediation of learning (Congos, 2002; Dawson, 2014) and implicitly incorporate these practices. The program utilizes a peer-assisted learning model where SI leaders (undergraduates who have completed the course successfully) are selected and trained to plan and lead sessions each week, facilitating collaboration and developing interpersonal skills, teamwork and a sense of community and belonging. An important component of SI has always been the voluntary nature of the sessions. SI is explicitly associated with historically difficult courses rather than an association with specific student populations, which theoretically reduces the perceived stigma some students may experience using academic support. As sessions are voluntary and open to all students in the course, sessions are attended by a variety of students, theoretically decreasing the potential deficit perspective that can be associated with other targeted support programs while also giving students autonomy and control of their own learning. A review of literature on student retention in higher education (Demetriou and Schmitz-Sciborski, 2011) established that holistic approaches addressing students' formal and informal experiences inside and outside of the classroom, taken up by multiple members of the campus community from across departments would have the most impact to retention rates. It firmly put the responsibility of student retention on the institution and recommended achievement of higher retention could be accomplished by offering easily accessible academic, personal and social support services. They found that interactions students have with faculty, staff, and peers can directly influence undergraduate retention, and the mechanism of action of this direct influence is that it affects students' sense of connection to the university, their ability to navigate the college experience and meet academic expectations. We acknowledge that the SI program could achieve this type of influence, but that intentional planning and action had to be taken to create and enact these holistic approaches. In this unprecedented semester of online instruction, students potentially being removed from the learning and community environment of the university, as well as additional external stressors of our country and the globe, the research collaborators were most concerned about students' well-being, motivation, ability to manage these stressors and overall academic and personal success. While the SI model values components such as voluntary attendance, research has shown that regular attendance (i.e. students attending eight sessions or more) has the highest impact to grade outcomes, retention and graduation rates, as well as students' sense of connection, belonging and positive experience in their first year. The researchers questioned whether a balance could be struck between requiring regular attendance to SI sessions, while still maintaining student autonomy and positive perceptions of SI as academic support for all. This report investigates the potential quantitative and qualitative impact of creating a registration-based SI program that encouraged students in this first year engineering course to sign-up for one SI session and to attend this session each week, while limiting the "enrollment" in each session to 12 students. In this way, the collaborators and SI Leaders were able to develop a cohesive community within each cohort, conduct community-building activities within sessions and track student attendance. This allowed for a more holistic approach to faculty-student and Leader-student interactions, both inside and outside the sessions. Examples of such community-building activities and holistic interactions will be presented in our paper. The study will utilize a mixed-methods approach, incorporating quantitative data relating to grades and SI session attendance, with qualitative data relating to student perceptions of the cohort-based model of SI sessions. The collaborators will use students' SI session attendance, students' demographic data, the D's, F's, W's and Q drop rates (QDFW rates) and end of semester course grades for attendees and non-attendees. Qualitative data will be collected in the form of surveys administered to SI session attendees in fall 2020 and small group/one-on-one interviews with attendees about their experiences in SI sessions. As

the SI program's effectiveness is assessed by aiming to reduce the QDFW rates in first year engineering courses and in turn retain more students to the ECE program, we plan to provide an in-depth analysis of how the SI program affects specific demographics, as well as compare students outcomes using previous experience in the subject matter as a proxy for preparedness, for a more accurate reflection of the effects of SI.

Adebola, O. O. (2020). The use of Supplemental Instruction in university classrooms as a strategy to enhance the academic performance of first-year students. *Universal Journal of Educational Research*, 8(11). doi: www.org/10.13189/ujer.2020.082268.

www.d1wqtxts1xzle7.cloudfront.net/65138398/UJER68_19516964.pdf?1607501366=&response-content-disposition=inline%3B+filename%3DThe_Use_of_Supplemental_Instruction_in_U.pdf&Expires=1613001902&Signature=bttdgMbBLa4EvVUpQ4usSEyo74PB4V5~5WIX0tTnemjyJz3m~DVGKLjFNrGvakBTHsQF0ftReiv04daEwo~hSLr4xkpYfrCOOgLo1Ec0iloTUXiRqjKK98Uz6epJF1ylAu4vtizMkAb-yiUU6CI9EWT0Aef-xQMifjsKQUofGLF2-eUsKtqedqrMQpaJQSDsQuJ0KH91DEYNzSZSjgREFuT5INuvbRBQy7Q2UB7YYW6rIN-inHFaQs4CM4u5Fd3Qk2ZSpqui3D3s2EDleIHsbbpyNlzGz7lgSJkiJNfLG0hF-NJUdqQZ~jWk-XxiVII0ipUL3JAKT1L1hJT9~hCWg__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA.

This study explores the use of Supplemental Instruction (SI), a type of academic support, to enhance the performance of first-year students in universities. This study, therefore, questions the challenges associated with the use of Supplemental Instruction in a university and the possible solutions. Social constructivism (SC) as a theoretical framework was adopted while Participatory Research (PR) was used because of its assumption that the coming together of the concerned people in the study would give them a sense of belonging, participation in problem definition, problem assessment, implementation and evaluation. Unstructured interviews were used to collect data. The participants of the study include two first-year students, two SI coordinators, two tutors and two lecturers from the selected university. Thematic Analysis (TA) was adopted to analyse, interpret and describe the generated data; as a result its involvement in the reflected categorised objectives. The study concluded that challenges, such as the gap in communication, that is, lack of effective communication and over enrolment were the major problems confronting the implementation of SI while up-to-date evaluation and feedback and provision of educational facilities were the solutions suggested to overcome these problems.

Chilvers, L. (2014). Communities of practice for international students: The role of Peer Assisted Study Sessions in supporting transition and learning in higher education. *Supplemental Instruction Journal*, 1(1), 90-115. www.info.umkc.edu/si/wp-content/uploads/2015/09/siJVolumeOne.IssueOne.ConferenceProceedings.pdf.

There is growing interest in understanding how international students can best be enabled to adjust to, participate in and learn from higher education (HE). This paper examines findings from a recent study in the UK which explored the contribution the Peer Assisted Study Sessions (PASS) scheme makes to this process. An earlier study used in-depth interviews with international students to generate data; following findings related to engagement with a learning community, this current study rescrutinised that data using Lave and Wenger's (1991) social-learning theory, Communities of Practice, as a theoretical lens. Themes of community, practice and participation were used to explore and understand the role of PASS in supporting international students' transition and learning in HE. Findings illuminated the role of PASS in helping international students to socially integrate with students of other nationalities, developing friendships with peers and PASS leaders, which literature evidences contributing to an increased sense of belonging to a community. Through the mutual engagement of attendees and leaders, students developed shared language, values and practices relating to their discipline and studying in UK HE. Established PASS leaders shared experiences of first year with 'newcomer' international students, supporting their transition into UK HE culture and enabling their legitimate peripheral participation to develop more fully. Participation in PASS fostered students' engagement with learning activities and independent study habits. Limitations to the study and suggestions for further research will also be discussed.

Clements, t. P., Friedman, K. L., Johnson, H. J., Meier, C. J., Watkins, J., Brockman, A. J., & Brame, C. (2022). "It made me feel like a bigger part of the STEM community": Incorporation of Learning Assistants enhances students' sense of belonging in a large introductory biology course. *CBE-Life Education*, 21(2). doi: <https://doi.org/10.1187/cbe.21-09-0287>. <https://www.lifescied.org/doi/epdf/10.1187/cbe.21-09-0287>.

Large introductory science courses are a particularly important and challenging target for creating inclusive learning environments. In this study, we examined the impact of incorporating learning assistants (LAs) on the learning environment in an introductory biology course taught with two different structures: an in-person lecture with intermittent active-learning components and an online setting taught with a flipped instructional approach. Using a survey that measured sense of belonging in a single class, we found that students in sections with LAs reported greater sense of belonging than students in sections without LAs in both class structures. Further, student focus groups revealed that LAs promoted learning and engagement in the class

by answering questions and providing clarity; allowing more use of active- and interactive-learning structures; and serving as accessible, approachable, and immediate sources of help. Student responses also indicated that LAs promoted a sense of belonging in science, technology, engineering, and mathematics (STEM) by decreasing feelings of isolation, serving as inspirational role models, clarifying progression through the STEM educational system, and helping students become more engaged and confident in their STEM-related knowledge and skills. These findings indicate that LAs can support multiple elements of inclusive STEM learning environments.

Connelly, A., Pagano, S., Rogers, B., & Mulvaney, T. (2022). Sense of belonging in higher education: Developing and measuring a sense of belonging across student programs *Implementing diversity, equity, inclusion, and belonging in educational management practices*: IGI Global

This chapter discusses the importance of a 'sense of belonging' to student success among students participating in three different programs: first-year composition at a private 4-year university, supplemental instruction at a private 4-year university, and non-credit coursework at a community college. These program examples connect the program purpose and operation to a sense of belonging. Suggestions are also included to improve a sense of belonging within the programs. Finally, special factors within each program are addressed through the lens of a sense of belonging.

Fink, A., Frey, R. F., & Solomon, E. D. (2020). Belonging in general chemistry predicts first-year undergraduates' performance and attrition. *Chemistry Education Research and Practice*. doi: www.org/10.1039/D0RP00053A.
www.pubs.rsc.org/en/content/articlelanding/2020/RP/D0RP00053A#!divAbstract.

Feeling a sense of belonging in a learning environment can have positive effects on student success. The impact of this psychosocial variable on undergraduates' achievement and retention has been demonstrated in STEM disciplines, especially for women within physical sciences where large disparities in gender representation persist. The current study explores the relationship between belonging and student success in undergraduate chemistry, where greater gender parity has recently emerged. In particular, this research investigates the belonging of first-year students enrolled in a two-semester General Chemistry course sequence. The study begins by examining whether students' early sense of belonging in the course, indexed by two survey measures (perceived belonging, belonging uncertainty) varies depending on their demographics and academic preparation. The belonging measures are then used as predictors of performance in General Chemistry 1 and 2 and attrition from one semester to the next. Paralleling research in other STEM disciplines, the results show that female students, especially those from underrepresented minority groups, reported lower belonging and higher uncertainty than male students within the first weeks of the course. After accounting for demographics, preparation, and participation in a course supplemental program, the belonging measures predicted performance and attrition for all students. These findings suggest that course-level belonging in General Chemistry can have practical consequences for student success, and early disparities in belonging may have downstream effects on the retention of women and other groups underrepresented in STEM. Strategies for creating an inclusive and engaging environment that supports the success of all students are discussed.

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.

Holland, S. L., Reyes, S., & Varelas, A. (2020). The impact of a Supplemental Instruction program on diverse peer leaders at a two-year institution. *Journal of Peer Learning*, 13(1), 5-20.
www.ro.uow.edu.au/cgi/viewcontent.cgi?article=1161&context=ajpl.

Supplemental Instruction (SI) is a peer-led academic support program in which SI Leaders help students develop study habits and note-taking strategies as well as facilitate test preparation. While the effects of SI on students receiving the instruction have been thoroughly investigated, there have been far fewer studies that have assessed the impact of SI on its Leaders. Furthermore, research on Leaders has yet to adequately consider community colleges or Hispanic-Serving Institutions (HSIs), or to employ qualitative methodologies. Thus, this paper details an SI program developed at a two-year HSI and the impact of the SI Leaders' experience via qualitative data analysis of structured, open-ended interviews. The majority of Leaders described shifts in long-term goals or changes in learning styles from individual learning and a desire to "look smart" to one that embraced asking for help, peer learning, and belonging. The data indicate a shift in academic mindset among Leaders, particularly among minority male and female adult learners and Latino males.

Luse, K. M. (2022). *Growing our embedded tutoring program: Creative solutions for a small college*. Conference Proceedings of the JMM Joint Mathematics Meetings.

The STEM departments at Trinity Washington University introduced an embedded tutor program as part of our Inclusive Excellence initiative. Embedded tutoring began with tutors placed in "gateway" courses as well as courses identified as common "stop-out" points in the STEM major curriculums. Preliminary results have shown improved student outcomes through course grades, retention, and sense of belonging. The program is growing to include tutors in gateway courses for non-STEM majors as well. This talk will include an overview of our program, challenges we've faced, creative ways our tutoring program has met a variety of student needs, and how we are assessing the program. Funding for our embedded tutoring program is partially supported by a Howard Hughes Medical Institute Inclusive Excellence grant.

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 SI supervisors 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.

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.

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.

Oppland-Cordell, S. B., & Martin, D. B. (2015). Identity, power, and shifting participation in a mathematics workshop: Latina students' negotiation of self and success. *Mathematic Education Research Journal*, 27, 21-49. doi: 10.1007/s13394-014-0127-6.

This article describes and explains shifts in participation among eight mathematically successful Latin@ undergraduate students who were enrolled in a culturally diverse calculus I workshop that was part of a university-based Emerging Scholars Program. Two questions are explored: (a) How do students explain success-oriented shifts in participation that occurred over time in the workshop setting? and (b) How were these success-oriented shifts related to students' evolving mathematical and racial identities? Drawing on Wenger's (1998) social ecology of identity framework, the analysis shows that participants constructed strengthened identities of participation over time through three modes of belonging (engagement, imagination, and alignment) within two dimensions (identification and negotiability). Given the predominantly White university context, Latin@ Critical Theory was used to help uncover how strengthened participation

was related to what it meant for participants to be Latin@. Findings also support intentional collaborative learning environments as one way to foster mathematics success and positive identity development among Latin@ students.

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 Annual 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 focuses 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.

Stanich, C. A., Pelch, M. A., Theobald, E. J., & Freeman, S. (2018). A new approach to Supplementary Instruction narrows achievement and affect gaps for underrepresented minorities, first-generation students, and women. *Chemistry Education Research and Practice*, 19(3), 846-866. doi: 10.1039/C8RP00044A. Available online www.kopernio.com/viewer?doi=10.1039/C8RP00044A&route=5.

To help students who traditionally underperform in general chemistry, we created a Supplementary Instruction (SI) course and called it the STEM-Dawgs Workshops. These workshops are an extension of the Peer-led Team

Learning (PLTL) SI. In addition to peer-facilitated problem-solving, we incorporated two components inspired by learning sciences: (1) training in research-based study skills, and (2) evidence-based interventions targeting psychological and emotional support. Here we use an explanatory mixed methods approach to measure the impact of the STEM-Dawgs Workshops, with a focus on four sub-populations that are historically underrepresented in Chemistry: underrepresented minorities, females, low-income students, and first-generation students. Specifically, we compared three groups of students in the same General Chemistry course: students in general chemistry and not the workshops ("Gen Chem students"), students in the workshops ("STEM-Dawgs"), and students who volunteered for the workshops but did not get in ("Volunteers"). We tested hypotheses with regression models and conducted a series of focus group interviews with STEM-Dawgs. Compared to the Gen Chem population, the STEM-Dawg and Volunteer populations were enriched with students in all four under-represented sub-populations. Compared to Volunteers, STEM-Dawgs had increased exam scores, sense of belonging, perception of relevance, self-efficacy, and emotional satisfaction about chemistry. URM STEM-Dawgs had lower failure rates, and exam score achievement gaps that impacted first-generation and female Gen Chem students were eliminated in the STEM-Dawg population. Finally, female STEM-Dawgs had an increased sense of belonging and higher emotional satisfaction about chemistry than women volunteers. Focus groups suggested that successes came in part from the supportive peer-learning environment and the relationships with peer facilitators. Together, our results indicate that this supplementary instruction model can raise achievement and improve affect for students who are underrepresented in chemistry.

Stoen, S. M. (2020). *Peer-Led Team Learning in Calculus based introductory physics: Implementation and evaluation*. (Ph.D. dissertation), Washington University in St. Louis (MO).

Robust evidence shows that Peer-led Team Learning (PLTL) improves the academic success of college students in introductory Science, Technology, Engineering, and Mathematics (STEM) courses. However, further research is needed to gain a fuller understanding of the benefits of PLTL and the aim of this dissertation is to explore two key and understudied questions surrounding the effects of PLTL. First, does deviating from the optimal implementation of PLTL change its effectiveness? Second, what specific outcomes, in addition to academic success (e.g., exam scores), does PLTL improve? This dissertation will provide a fuller picture of the impact of PLTL by examining its effect on a wide range of academic success (e.g., exam scores), learning (e.g., conceptual knowledge, expert-like attitudes and approaches, knowledge structure) and social-psychological (e.g., growth mindset, sense of belonging) measures for a calculus-based introductory physics course. Furthermore, to fully understand the differences between the PLTL and non-PLTL participants all analyses are disaggregated by demographics (sex, race and year in college). This dissertation highlights that there are a number of crucial factors you must have in order to obtain a robust benefit from PLTL.

Strait, M. (2023). *Assessing Supplemental Instruction leaders' intercultural competence and culturally responsive practices in non-traditional learning environment*. (Ph.D. dissertation), Purdue University.
<https://hammer.purdue.edu/download/files/39417886>

Social justice researchers and practitioners have beckoned post-secondary institutions to provide inclusive and culturally responsive instructional practices that promote students' sense of belonging and empowerment. However, little research has demonstrated how competent intercultural behaviors can connect to one's integration of culturally responsive teaching. Therefore, this explanatory sequential mixed-methods study examined the interplay between these components within a distinguished undergraduate peer learning program, Supplemental Instruction (SI). Undergraduate SI leaders' behaviors were examined for their intercultural competence level, potential influencers, and valued commitment to diversity and inclusion. This study was supported and guided by Hammer's (2012) Intercultural Development Continuum (IDC) and Gay's (2018) Culturally Responsive Teaching (CRT) practices. Quantitative data were collected using Hammer's (2012) Intercultural Development Inventory (IDI), and qualitative data were in the form of interviews and analyses of leaders' session plans. The findings revealed that participants overestimated their intercultural competence. Relatedly, participants expressed concerns of uncertainty beyond solely acknowledging diversity and addressing intercultural insensitivity. Curricular and co-curricular programming were potential influencers to the leaders' intercultural competence knowledge (i.e., cultural self-awareness, culture-general, and culture-specific). Additionally, implications include recommendations for higher education administrators' initiatives for more inclusive and culturally responsive peer-learning programs.

Upmacis, R. K. (2021). Peer-Led Team Learning and student success. *Advances in Peer-Led Learning*, 1, 25-43. doi: <https://doi.org/10.54935/apll2021-01-04-25>. [www.doi.org/10.54935/apll2021-01-04-25](https://doi.org/10.54935/apll2021-01-04-25).

Peer-Led Team Learning (PLTL), a nationally recognized teaching and learning model, was introduced into the General Chemistry course at Pace University in 2014. The objective of this study was to determine the effect of the introduction of PLTL on the students' final exam scores, and through surveys, determine how students

viewed both the PLTL program and their Peer Leaders. In addition, this study sought to monitor the progress of Peer Leaders as they entered an upper-level Inorganic Chemistry class to determine whether the experience of being a Peer Leader helped their success in this course. The biggest difference, when comparing exam scores from two separate years before and after PLTL implementation, was found to be 10%. However, upon averaging exam scores over several years before and after the introduction of the PLTL program, a more modest average increase of 4% was determined. It was found that students with Peer Leader experience performed better in an upper-level Inorganic Chemistry class compared to those with no Peer Leader experience. Results from surveys administered to both students and Peer Leaders regarding their experiences, as well as the results from students evaluating their Peer Leaders, are reported here. Overall, the implementation of PLTL has led to greater interactions between the Instructor, Peer Leaders, and undergraduate students, thereby furthering a greater interest in chemistry and increasing the students' sense of community.

Van der Meer, J., Skalicky, J., & Speed, H. (2019). "I didn't just want a degree": Students' perceptions about benefits from participation in student leadership programmes. *Journal of Leadership Education*, 19(1), 25-44.

Increasingly, universities are involved in providing leadership development opportunities that support students' academic endeavours and their personal and professional development, including employability and citizenship skills. Leadership experiences are beneficial not only for students, but also for universities, the wider community, and future employers. To develop a greater understanding of students' perceived benefits of their involvement in peer leadership activities, a group of Australasian universities participated in a pilot survey based on the United States National Survey of Peer Leadership. Overall, the results suggest students believe they benefit from peer leadership experiences across a range of key outcomes areas, most prominently creative problem solving, appreciation of diversity, and a sense of belonging and contributing to the university community.