

A framework for understanding Supplemental Instruction is presented along with theoretical and philosophical underpinnings.

Understanding the Supplemental Instruction (SI) Model

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An Overview of Supplemental Instruction (SI)

Supplemental Instruction (SI) is a student academic assistance program that increases academic performance and retention through its use of collaborative learning strategies. The SI program targets traditionally difficult academic courses--those that typically have 30 percent or higher rate of D or F final course grades and/or withdrawals--and provides regularly scheduled, out-of-class, peer-facilitated sessions that offer students an opportunity to discuss and process course information. (Martin, et al., 1977).

High risk courses vs. high risk students. SI thus avoids the remedial stigma often attached to traditional academic assistance programs since it does not identify *high-risk students*, but identifies *high-risk classes*. SI is open to all students in the targeted course; therefore, pre-screening of students is unnecessary. Since the SI program begins the first week of the academic term, the program provides academic assistance during the critical initial six-week period of class before many students face their first major examination. Attrition is highest during this period. (Blanc, et al., 1983; Noel, et al., 1985).

Historically difficult or "high risk" courses often share the following characteristics: large amounts of weekly readings from both difficult textbooks and secondary library reference works, infrequent examinations that focus on higher cognitive levels of Bloom's taxonomy, voluntary and unrecorded class attendance, and large classes in which each student has little opportunity for interaction with the professor or the other students. SI is often attached to traditionally difficult, high-risk courses that serve first and second-year students. Several institutions report the successful use of SI with students in graduate and professional schools. (Bridgham & Scarborough, 1992; Martin, et al., 1992; Martin, 1980). However, each institution may develop its own definition of "high-risk courses."

Such a designation of "high risk" for a course makes no prejudicial comment about the professor or the students. It is a numerical calculation that a sizeable number of students have difficulty in meeting academic requirements for the class. Rather than blaming the students or the professor, the designation suggests that additional academic support is needed for students to raise their level of academic performance to meet the level deemed appropriate by the classroom professor. In recent years the popular and professional literature has been replete with extensive discussions about who is at fault for the perceived lower quality of student academic achievement. SI bypasses this issue and provides a practical solution that helps students meet the professor's level of expectation.

Proactive assistance before problems occur. Assistance begins in the first week of the term. The SI leader introduces the program during the first class session and surveys the students to establish a schedule for the SI sessions. Attendance is voluntary. Students of varying abilities participate, and no effort is made to segregate students based on academic ability. Since SI is not perceived to be remediation, many unprepared students that might otherwise avoid seeking assistance will participate since there is no stigma attached. Such stigmas can cause motivation problems for developmental students. (Somers, 1988).

SI enables students to master course content while they develop and integrate effective learning and study strategies. Therefore, learning/study strategies (e.g., note-taking, organization, test preparation) are integrated into the course content during the SI sessions. Immediate practice and reinforcement of these acquired skills is provided. SI collaborative sessions capitalize on the use of the "teachable moment" to apply the learning strategies to the course material. Educational researchers (Dimon, 1988; Keimig, 1983; Stahl, et al., 1992) have concluded that it is difficult to teach transferable study skills in isolation from content material.

Features of SI that Contribute to Student Success. The impact of Supplemental Instruction can be quantified by positive differences in student performance and retention rates. Several features of the SI model operate to influence higher levels of student academic performance. The following factors are most often mentioned by SI staff as well as by participating faculty and students. (Martin et al., 1983)

The service is proactive rather than reactive. SI schedules are set during the first week of class, allowing students to obtain assistance before they encounter academic difficulty. Most "early alert" retention programs are not triggered until the student has already earned a D or F on a major examination.

The service is attached directly to specific courses. Reading, learning, and study skill instruction is offered in the context of course requirements and as an outgrowth of student questions and concerns. Instruction thus has immediate application. While many students may self-report their need for academic assistance, only a small group will voluntarily attend workshops that feature instruction in isolated study skills.

SI leaders attend all class sessions. Such attendance contrasts sharply with the more common tutorial practice of providing instruction based largely upon the student's perceptions of what occurred in class. Student perceptions are often distorted as well as time consuming to report during the academic assistance sessions.

By design, SI is not a remedial program. Although SI is effective with underprepared students, it is not viewed as remedial. The students who are most likely to volunteer initially are those who tend to be better prepared academically. The willingness of this group to participate encourages the participation of less able students who often find it difficult to admit that they need assistance.

SI sessions are designed to promote a high degree of student interaction and mutual support. Such interaction leads to the formation of peer study groups and facilitates the mainstreaming of culturally diverse as well as disadvantaged students. SI has relied upon the power of group study for the past twenty years, long before the current trend of promoting collaborative learning groups in higher education.

SI provides an opportunity for the course instructor to receive useful feedback from the SI leader. Students generally hesitate to be candid about academic concerns to course instructors for fear of demeaning themselves or offending the professor. They will, however, openly acknowledge their problems to the SI leader. The duty of the SI leader is to listen to their comments and then to redirect the students toward developing strategies to cope with the situation. The SI leader is not to assess the course professor or agree/disagree with student comments. If the course professor has previously invited feedback from the SI leader, the SI leader shares student comments or concerns in a non-threatening and anonymous fashion privately with the course instructor.

Situations in which SI May Be Less Effective. While success varies among and between SI programs, we are not in possession of data that would suggest that SI has any major limitations. We do know, however, that conducting SI is more challenging in content areas where prerequisite skills are a key variable.

For example, if students do not remember any algebra, they will have a particularly difficult time in chemistry. SI can be and is effective in these areas.

However, SI leaders must invest more time in planning. SI sessions will often need to last longer than fifty minutes to cover additional material and provide additional time for students to practice with and master the course material and study strategies. Additionally, SI groups may need to be reorganized to insure that those who are more able mathematically are not bored by those who review the basics of algebra.

It has been our experience that SI is least effective when it is attached to remedial classes. First, students may refuse to attend SI sessions if they do not perceive the course to be demanding. Second, SI has not been effective for students who cannot read, take lecture notes, write, or study at the high school level. Therefore, we stress to adopting institutions that they use SI in non-remedial settings with high-risk, demanding courses.

We have also found that the SI model needs to be slightly modified in courses that are problem-based and involve practice for mastery. In those circumstances, SI sessions need to be more frequent and sometimes longer. For example, a three credit-hour accounting course might require sufficient SI sessions to allow for the review of various types of problems, or a calculus class might require extended sessions to allow time for modeling and practice so that students become proficient problem solvers.

Key SI Program Personnel. There are key persons involved with SI on each campus--the SI leaders, the SI supervisor, and the course instructors. Each plays an important role in creating the environment that allows the SI program to flourish.

With the increasing diversity of the college classroom and level of academic preparedness, institutions are seeking to develop a community of learners. SI helps promote the formation of such communities and promotes scholarship through increased academic performance and retention of students. Faculty enjoy the resources and support provided by the SI leader.

The SI leader. The SI leader is a student who has successfully completed the targeted class or a comparable course. It is ideal if the student has taken the course from the same instructor for whom he or she is now providing SI assistance. The SI leader is trained in proactive learning and study strategies and operates as a "model student," attending all course lectures, taking notes, and reading all assigned materials. The SI leader conducts three or more out-of-class SI sessions per week during which he/she integrates "how to learn" with "what to learn." (Martin et al., 1983).

The SI leader is a facilitator, not a mini-professor. The role of the leader is to provide structure to the study session, not re-lecture or introduce new material. The SI leader should be a "model student" who shows how successful students think about and process course content. He or she facilitates a process of collaborative learning, an important strategy since it helps students to empower themselves rather than remain dependent as they might in traditional tutoring. Research suggests that tutoring relationships do not always promote transfer of needed academic skills (Blanc, et al., 1983; Dimon, 1988; Keimig, 1983; Martin, et al., 1992, 1990, 1983, 1981, 1980, 1977; Maxwell, 1990).

A central responsibility of the SI leader is to integrate study skills with the course content. As someone who has performed well in the course, the SI leader has displayed mastery of the course material. However, it is important for the SI leader to share his/her learning strategies with the other students in the SI sessions. If the students only learn content material and not the underlying study strategies, they will have a high probability of experiencing academic difficulty in succeeding courses.

The integration of study skills with the course content is a key difference between SI and other forms of collaborative learning. It is not just that students are working together. Rather, it is the planned integration and practice of study strategies that sets SI apart. We believe that by combining *what to learn* with *how to learn it*, students are able to develop both content competency and transferrable academic skills that pay off in higher grades during future academic terms.

The SI supervisor. The SI supervisor is an on-site professional staff person who implements the SI program and supervises the SI leader. The supervisor is responsible for identifying the targeted courses, gaining faculty support, selecting and training leaders, and monitoring and evaluating the program. Supervisors meet with SI leaders weekly during the term as a group or individually. Supervisors of most programs have formal meetings with all SI leaders together at least three times during the term for follow-up and problem-solving.

SI supervisors attend a three and one-half day training workshop covering the areas of implementation and management, training, supervision, evaluation, and study strategies. Continued professional development is available through professional development seminars.

The faculty member. The third key person in implementing SI is the faculty member who teaches the course in which SI is offered. Faculty screen SI leaders for content competency. SI leaders are encouraged to meet weekly with SI course faculty members during their office hours to discuss SI session activities. Faculty cooperation is an essential ingredient of the SI model. Therefore, SI is only used in classes where professors understand and support the idea. This policy holds true even if department chairs and deans request that SI be attached to certain classes.

While regular meetings are encouraged, faculty are free to choose their level of involvement with the SI leaders and the program supervisor. Some faculty members choose to meet with the SI leader to plan for SI sessions. This may include the creation of work sheets, mock examinations or other materials. Many other faculty also request that the SI leader provide anonymous feedback from students concerning difficulties encountered during class lectures or with the reading materials. On the other hand, some faculty choose not to devote additional time to the program. The SI program staff makes every effort to be supportive of the professor. This support might include checking the bookstore to see that the number of textbooks is sufficient to accommodate the number enrolled; calling students who are absent; checking materials on reserve in the library; and handing out materials during class. The only restrictions placed on SI leaders are that they may not share the SI session attendance sheets nor help create or grade course examinations.

Creating Awareness and Generating Support for SI on Campus. Gaining acceptance for any new student support program has historically been a difficult undertaking, especially in times of limited resources. Additionally, since the impetus for new academic support programs often comes from administrators or student affairs staff, there is the risk of a potential opposition among the faculty.

Our experience (Martin, et al., 1983), as well as reports from other institutions that have adopted SI, lead us to the following four suggestions for generating on-campus program support:

It is essential, from our experience, to *receive training in the use of the SI program*. While one of the basic tenets of SI programs is relatively simple -- integration of course content review with study strategy practice -- implementation is more complex. Issues and activities often covered during training workshops include mock SI session participation; SI session supervision; SI leader training topics; data collection and analysis activities; strategies to promote the SI program; and other practical issues related to program implementation and growth.

Such workshops are held in Kansas City and at a variety of locations across the U.S., providing an opportunity to not only receive helpful training, but also to meet with other institutions that are also present for the workshop. Part of the reason that SI has continued to grow and evolve for the last two decades has been the interaction between other adopting institutions.

Our second recommendation for generating on-campus support is to *have a pilot program approach to starting SI*. The best way to generate on-campus support is to

have a successful pilot in place. Faculty members who have had positive experiences with SI become the program's strongest advocates.

We advise adopting institutions to begin a pilot program by *eliciting the support of one or two faculty members who are well respected by their peers and teach entry level courses that are traditionally difficult for students*. These faculty should have reputations as excellent instructors who have both rigorous and fair grading standards. They should also be willing to assign a higher than normal distribution of A, B, and C grades if students display increased levels of performance on examinations.

Our final suggestion for generating support for SI is in regards to the data collected. After conducting the pilot program, it is critical to *prepare and disseminate final reports on the outcomes*. Part of the attraction of SI to administrators and faculty members is the analysis of hard data (i.e., final course grades) of the SI participants as compared with non-participants. It is also helpful to present the findings to other faculty who may be interested in attaching SI to their courses. We suggest that faculty again be approached individually, in small groups, or in departmental meetings. The SI supervisor should invite the instructors who were involved in the pilot to be part of these presentations.

When Supplemental Instruction has been carried out on other campuses without a pilot program to generate initial on-campus support (for example, when it has been mandated by an administrator), the service has been less than successful. Once faculty concerns are made public, it is difficult to address them adequately, and attempts to do so are often viewed with skepticism. On the other hand, if SI is willingly piloted with a school or department, the program will generate its own support. One final note: While the UMKC SI program has not been a success with all the students who have tried it, we have yet to lose a single faculty member!

Different Approaches to Assisting Students

Robert Blanc, Ph.D., Associate Professor and Curriculum Specialist for the School of Medicine at the University of Missouri-Kansas City, should be credited with the conceptual framework for comparing and contrasting the traditional (medical) and nontraditional approaches to assisting students.

Traditional Approaches to Assisting Students. Traditional individual tutorial practices may be described as following a medical model: an individual is identified as needing professional assistance on the basis of a) prior history and diagnostic testing, b) self-referral in response to perceived symptoms, or c) referral by another professional in response to observed symptoms. In some institutions, identification of high-risk students is based primarily on prior history of test scores (see "a" above). These tertiary institutions are likely to be somewhat selective, requiring students to submit to extensive pre-matriculation testing and interviews. Professional schools and private, selective colleges are among those fitting this category. Students entering such institutions typically commit for the long term and, at a minimum, can be expected to persist for at least a year. Under these circumstances, academic therapy with students at risk can begin immediately upon matriculation and can continue until students give evidence of being able to function independently in the academic environment.

As noted in "b" above, some students voluntarily seek assistance. Their symptoms in these instances may range from free-floating anxiety in the academic setting to unsatisfactory performance in one or more highly specific settings. The tutor or resource specialist must function first as diagnostician, identifying the basis for the students' self-referral and differentiating between anxiety and a variety of other reasons for unsatisfactory performance. Having established at least a tentative diagnosis, the tutor then becomes the therapist, helping students to negotiate the academic demands of the institution.

Use of "c" above requires another professional, usually a professor or graduate teaching assistant, to become aware that a student is in academic difficulty. This awareness may come in a variety of ways, most likely in the wake of unsuccessful performance on an academic task. For example, the faculty member may refer the student for tutorial assistance to correct an academic problem that has become apparent because of a low test score. In this instance, the tutor functions, as described in the previous paragraph, first as a diagnostician and then as a therapist.

Rationale for a Non-Traditional Approach. It was in a milieu dominated by tutorial services in the medical model that SI developed. The developers at UMKC found that several assumptions of the medical model either did not apply or were not practiced in their institution. Subsequent adoption of SI on other campuses may suggest that the same assumptions were found wanting on these other campuses as well.

As noted, the traditional model relies on identification of the "high-risk" student, the student who is deemed to be deficient or "at-risk" in some way. In institutions other than those described, (i.e., selective tertiary and professional schools), several factors preclude such pre-matriculation identification.

First, entering students must be known to the faculty and staff in time for key personnel to establish contact with at-risk students. Second, it must be noted in this context that neither prior performance nor standardized testing is sufficiently reliable as a prediction criterion of who is and is not at risk. As many as 50 percent of those whose prior scores suggest they are at risk prove to be successful without intervention, and many of those who are not identified in this manner prove to be unsuccessful.

Analysis of high school grades and standardized college entrance examinations do not identify all students who will drop out of college for academic reasons (Blanc, et al., 1983; Christie & Dinham, 1991; Martin et al., 1983; Tinto, 1987) and attrition cannot be addressed effectively by providing help only to those students who show either symptoms or predisposing weaknesses. The treatment must be more generalized, and the problem must be addressed at or near its source: *the mismatch between the level of instruction and the level of student preparation.* (Martin, et al., 1977).

Timely identification of students who are at risk is difficult in the traditional model. Faculty who can refer students for corrective instruction are rarely able to make a referral before the scoring of the first course examination. Students who are referred after that time are at a considerable disadvantage, trying to catch up with the class after a very poor start. The rate of student attrition across courses is greatest in the first six weeks or after the first exam when students may find their grades disappointing (Blanc, et al., 1983; Noel, et al., 1985).

Students who are at risk are among those least compliant with faculty recommendations for special help, whether for personal counseling or for academic assistance. Such students often perceive that tutorial help, far from relieving them of their academic burden, increases the burden as they must now answer to a tutor in addition to the course professor.

Finally, students who are at risk are notorious for their reluctance to refer themselves for assistance until much too late. Whether through denial, pride, or ignorance, students who need help the most are least likely to request it. So goes the axiom of the learning assistance trade. (Somers, 1988).

SI first developed in an institution that did not fit into the medical model described previously in this chapter. At UMKC, students can register as late as the first day of class, with their prior transcripts and test score data to be submitted sometime before the beginning of the following semester. This large, inner-city, commuter institution, typically turned over 40 percent of its students each semester, most of them due to transfer but some due to the phenomenon now known as "stopping out" as distinguished from "dropping out." "Stopping out" referred to the widespread practice of

taking no classes during a semester that would be devoted to other priorities such as working to reestablish a bankroll sufficient to allow subsequent reentry.

Delivery of services from the first day of class changes the support program from a *reactive* to a *proactive mode*. One of the non-cognitive variables that differentiates between more capable and less capable students is this: those who are less capable are inclined to do without support services until they need them; those who are more capable will avail themselves of services at the beginning and stop services if they find the services to be neither productive nor essential. The presence of these more capable students in support sessions affirms that the sessions are not remedial. That fact enables less capable students to participate without the fear of stigma.

The integration of skills and content allows the SI leader to meet the perceived content needs of students while delivering essential skills instruction simultaneously. If, as McLuhan argued, "the medium is the message," then the message of SI is skill instruction, delivered along with the course content material.

Delivering services on an outreach basis (i.e., in the classroom buildings assigned for regular academic instruction), lends an air of academic credibility to the support service. Similarly, the overt endorsement of the SI program from the participating course professor lends further authority to the claim that SI is valuable.

Of course, the voluntary nature of the SI pact--which is renewable every week (or every day, for that matter)--comforts the wary student who shuns taking on additional responsibility. The combination of voluntary participation, early intervention, and proactive support differentiates the SI model from the traditional medical model that relies on diagnosis of signs and symptoms followed by prescriptive treatment.

Conclusion

It has been nearly two decades since Supplemental Instruction first appeared in higher education. After starting at the University of Missouri-Kansas City in 1973, it has been implemented at a variety of institutions across the U.S. and around the world. Borrowing ideas from developmental psychology, SI has attempted to encourage students to become actively involved in their own learning. By integrating appropriate study skill with the review of the course content, students begin to understand how to use the learning strategies they have heard about from teachers and advisors. As new educational theories and practices have surfaced, the SI model has been adapted to incorporate the best in educational research.

With the increasing diversity of today's college students and the advent of alternative admission programs, the student body is continuing its evolution into a heterogenous group reflective of American society. The popular and professional literature often carries articles decrying the poor academic preparation level of students and/or poor quality of teaching by classroom professors. Few solutions have been offered that work. From our point of view, the matter is moot. Many professors have tenure and colleges need all the students that they can recruit. Rather than blaming either of the two parties, strategies must be developed that allow for students to succeed while ensuring that academic standards are maintained, if not strengthened. SI, as one component, can help contribute to an overall institutional plan for student success.

References

- American College Testing Program. ACT institutional data file, 1992. Iowa City, IA: American College Testing Program, Inc., 1992.
- Arons, A.B., & Karplus, R. "Implications of accumulating data on levels of intellectual development", American Journal of Physics, 1976, 44, 386.
- Belenky, M.F., Clinchy, B.M., Goldberger, N.R., & Tarule, J.M. Women's ways of knowing: The development of self, voice, and mind. New York: Basic Books, 1986.
- Blais, D.M. "Constructivism: A theoretical revolution in teaching", Journal of Developmental Education, January 1988, 11(3), 2-7.
- Blanc, R.A., DeBuhr, L., & Martin, D.C. (1983). "Breaking the attrition cycle: The effects of Supplemental Instruction on undergraduate performance and attrition", Journal of Higher Education, 1983, 54(1), 80-89.
- Bridgham, R.G., & Scarborough, S. "Effects of Supplemental Instruction in selected medical school science courses", Academic Medicine RIME Supplement, 1992, 67(10), 569-571.
- Brookfield, S.D. Developing critical thinkers: Challenging adults to explore alternative ways of thinking and acting. San Francisco: Jossey-Bass, 1987.
- Chaffee, J. "Critical thinking skills: The cornerstone of developmental education", Journal of Developmental Education, Spring 1992, 15(3), 2-4, 6, 8, 39.
- Christie, N.G., & Dinham, S.M. "Institutional and external influences on social integration in the freshman year", Journal of Higher Education, 1991, 62, 412-436.
- Cooper, J., Prescott, S., Cook, L., Smith, L., Mueck, R., Cuseo, J. Cooperative learning and college instruction: Effective use of student learning teams. Long Beach, CA: The California State University Foundation, 1990.
- Dimon, M. "Why adjunct courses work", Journal of College Reading and Learning, 1988, 21, 33-40.
- Fuller, R.G. (ed.). Piagetian programs in higher education. Lincoln, NE: ADAPT, 1980.
- Goodsell, A., Maher, M., & Tinto, V. Collaborative learning: A sourcebook for higher education. University Park, PA: National Center on Postsecondary Teaching, Learning, and Assessment, 1992.
- Johnson, R.T., & Johnson, D.W. "Action research: Cooperative learning in the science classroom", Science and Children, 1986, 24, 31-32.
- Johnson, D.W., Johnson, R.T., Holubec, E.J., & Roy, P. Circles of learning: Cooperation in the classroom. Washington, D.C.: Association for Supervision and Curriculum Development, 1984.
- Karplus, R., Lawson, A.E., Wollman, W., Appel, M., Bernoff, R., Howe, A., Rusch, J.J., & Sullivan, F. Science teaching and the development of reasoning: A workshop. Berkeley, CA: Regents of the University of California, 1976.
- Keimig, R.T. Raising academic standards: A guide to learning improvement. ASHE-ERIC Higher Education Report No. 4. Washington, D.C.: Association for the Study of Higher Education. ED 233 669, 1983.
- Light, R.J. The Harvard assessment seminars, Second Report: Explorations with students and faculty about teaching, learning, and student life. Cambridge, MA: Harvard University, 1992.
- Light, R.J. The Harvard assessment seminars: Explorations with students and faculty about teaching, learning, and student life. Cambridge, MA: Harvard University, 1992.
- Martin, D.C., Arendale, D., & Associates. Supplemental Instruction: Improving first-year student success in high-risk courses. Columbia, SC: National Resource Center for The Freshman Year Experience, 1992.

- Martin, D.C., & Arendale, D. "Supplemental Instruction: Improving student performance, increasing student persistence," ERIC Document Reproduction Service. ED 327 103, 1990.
- Martin, D.C., & Gravina, M. "Serving students where they fail: In class", Thresholds of Education, August 1990, 26, 28-30.
- Martin, D.C., Blanc, R.A., DeBuhr, L., Alderman, H., Garland, M., & Lewis, C. Supplemental Instruction: A model for student academic support. Kansas City, MO: The University of Missouri and ACT National Center for the Advancement of Educational Practices.
- Martin, D.C., & Blanc, R.A. "The learning center's role in retention: Integrating student support services with departmental instruction", Journal of Developmental Education, 1981, 4, 2-4, 21-23.
- Martin, D.C. "Learning centers in professional schools." In K.V. Lauridsen (ed.), New directions for college learning assistance: Examining the scope of learning centers. San Francisco: Jossey-Bass, 1980.
- Martin, D.C., and others. The learning center: A comprehensive model for college and universities. Kansas City, MO: University of Missouri, 1977. (ERIC ED 162 294).
- Maxwell, M. "Does tutoring help? A look at the literature", Review of Research in Developmental Education, 1990, 7(4), 1-5.
- Maxwell, M. Improving student learning skills: A comprehensive guide to successful practices and programs for increasing the performance of underprepared students. San Francisco: Jossey-Bass, 1979.
- Noel, L., Levitz, R., Saluri, D., & Associates. Increasing student retention: Effective programs and practices for reducing the dropout rate. San Francisco: Jossey-Bass, Inc., 1985.
- Piaget, J., & Inhelder, B. Growth of logical thinking. New York: Basic Books, 1958.
- Renner, J.W., Stafford, D.G., Lawson, A.W., McKinnon, J.W., Friot, F.E., & Kellogg, D.H. Research, teaching and learning with the Piaget model. Norman, OK: The University of Oklahoma Press, 1976.
- Resnick, L.B. Education and learning to think. Washington, D.C.: National Academy Press, 1987.
- Sandberg, K.E. "Affective and cognitive features of collaborative learning", Review of Research in Developmental Education, 1990, 6(4), 1-4.
- Shlipak, A.M. Engineering and physics as cultural systems: Impressions of science students at Harvard/Radcliffe. Thesis submitted to the Harvard University Department of Anthropology for the degree of Bachelor of Arts with Honors, 1988.
- Slavin, R.E., Maden, N.A., & Stevens, R.J. "Cooperative learning models for the 3 r's", Educational Leadership, December 1989/January 1990, 47, 22-28.
- Slavin, R.E. "Cooperative learning and student achievement", Educational Leadership, 1988, 46(2), 31-33.
- Slavin, R.E. Cooperative learning. New York: Longman, 1983.
- Spann, N.G. "Student retention: An interview with Vincent Tinto", Journal of Developmental Education, September 1990, 14(1), 18-20, 22, 24.
- Somers, R.L. Causes of marginal performance by developmental students. Boone, NC: National Center for Developmental Education, Appalachian State University, 1988.
- Stahl, N.A., Simpson, M.L., & Hayes, C.G. "Ten recommendations from research for teaching high-risk college students", Journal of Developmental Education, Fall 1992, 16(1), 2-4, 6, 8, 10.
- Tinto, V. Leaving college: Rethinking the causes and cures of student attrition. Chicago: The University of Chicago Press, 1987.

- Tomlinson, L.M. Postsecondary developmental programs: A traditional agenda with new imperatives. ASHE-ERIC Higher Education Report No. 3. Washington, D.C.: Association for Study of Higher Education, 1989.
- Treisman, U., & Fullilove, R.E. (1990). "Mathematics achievement among African-American undergraduates at the University of California, Berkeley: An evaluation of the mathematics workshop program", Journal of Negro Education, 1990, 59(3), 463-478.
- Tumey, S. (ed.). Annotated bibliography of student peer collaborative learning. Kansas City, MO: Center for Academic Development, University of Missouri-Kansas City 1993.
- Vygotsky, L.S. Mind in society. Cambridge, MA: Harvard University Press, 1978.
- Vygotsky, L.S. Thought and language. Cambridge, MA: Harvard University Press, 1962.
- Whitman, N.A. Peer teaching: To teach is to learn twice. ASHE-ERIC Higher Education Report No. 4. Washington, D.C.: Association for the Study of Higher Education, 1988.

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