Cooperative Learning

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The Johnson & Johnson model of cooperative learning came to ASEE at the 1981 Frontiers in Education Conference in Rapid City, SD, a little over 30 years after Morton Deutsch's pivotal article (Deustch, 1949). Dendy Sloan chaired a session that had two presentations on cooperative learning, one by Harold Goldstein and the other by Karl Smith. Following their presentations, Karl and Harold were invited to present a workshop on cooperative learning at the following FIE Conference. The 1982 cooperative learning workshop conducted by Harold Goldstein and Karl Smith was one of the first workshops devoted to helping engineering faculty learn how to implement cooperative learning in their classes. Also in 1981 Karl published an article in the *Journal of Engineering Education* on cooperative learning with David and Roger Johnson. It was titled "Structuring learning goals to meet the goals of engineering education." (Smith, Johnson & Johnson, 1981).

Another milestone year was 1989 when at the FIE Conference in Binghamton, NY three students from the Norwegian Institute of Technology in Trondheim, Norway described their student-led initiative to incorporate cooperative learning. Karl took a sabbatical in Norway during 90-91 to work with the students and faculty.

The early 90s were particularly strong for cooperative learning. David and Roger Johnson and Karl Smith published two books in 1991(Johnson, Johnson & Smith, 1991a, 1991b) – a research oriented report: *Cooperative learning: Increasing college faculty instructional productivity*, and a resource guide for faculty: *Active learning: cooperation in the college classroom* – which helped many faculty implement cooperative learning.

The 90s also saw terrific growth in the number of articles on cooperative learning and the number of practitioners. The number of articles on cooperative learning has grown substantially in the 17 years since Rapid City. There are currently over 400 articles on cooperative learning in science, math, engineering, and technology disciplines.

Last summer at the ASEE Annual Conference in Milwaukee, David and Roger Johnson presented the ERM Distinguished Lecture on cooperative learning and that was followed by an article in ASEE PRISM in February 1998 (Johnson, Johnson & Smith, 1998).

Also late last year three researchers at the University of Wisconsin, Madison completed a meta-analysis of the research on cooperative learning in college-level one science, mathematics, engineering, and technology (Springer, Stanne & Donovan, 1997). Mean effect sizes for achievement, persistence, and attitudes were 0.51, 0.46, and 0.55, respectively. Springer, et.al., state "The 0.51 effect of small-group learning on achievement reported in this study would move a student from the 50th percentile to the 70th on a standardized test. Similarly, a 0.46 effect on students' persistence is enough to reduce attrition in SMET courses and programs by 22%."

The data is pretty much in on the effectiveness of cooperative learning and the major challenges involve implementing it in engineering classrooms. There are several guides in the reference list to help faculty with the implementation piece (Campbell & Smith, 1997; Cooper, MacGregor & Smith, (in press); Johnson, Johnson & Smith, 1991b, 1997; Smith & Waller, 1997; Smith, 1995; Smith, 1996; Smith (in press); Smith & Waller, 1997).

References

Campbell, W.E. and Smith, K.A. (Eds.) 1997. *New paradigms for college teaching*. Edina, MN: Interaction

Cooper, J., MacGregor, J.& Smith, K. Cooperative learning in large lecture classes. *New Directions for Teaching and Learning*, (in press). San Francisco: Jossey-Bass.

Deutsch, M. 1949. A theory of cooperation and competition. *Human Relations*. *2*, 129-152.

Johnson, D.W., Johnson, R.T., and Smith, K.A. 1991a. *Cooperative learning: Increasing college faculty instructional productivity*, ASHE-ERIC Reports on Higher Education.

Johnson, D.W., Johnson, R.T., and Smith, K.A. 1991b. *Active learning: Cooperation in the college classroom.* Edina, MN: Interaction Book Company.

Johnson, D.W., Johnson, R.T., & Smith, K.A. 1997. Academic controversy: Enriching college instruction with constructive controversy. *ASHE-ERIC Higher Education Report, 25*. Washington, D.C.: The George Washington University.

Johnson, D.W., Johnson, R.T., & Smith, K.A. 1998. Maximizing instruction through cooperative learning. *ASEE Prism*, *7*(6), 24-29.

Smith, K.A. 1995. Cooperative learning: Effective teamwork for engineering classrooms. *IEEE Education Society/ASEE Electrical Engineering Division Newsletter*. March, 1-6.

Smith, K.A. 1996. Cooperative learning: Making "groupwork" work. In C. Bonwell & T. Sutherlund, Eds., Active learning: Lessons from practice and emerging issues. *New Directions for Teaching and Learning 67*, 71-82. San Francisco: Jossey-Bass.

Smith, K.A. Grading cooperative projects. In B. Anderson & B.W. Speck, Eds., Grading students' performance: Theory and practice. *New Directions for Teaching and Learning*, (in press). San Francisco: Jossey-Bass

Smith, K.A., Johnson, D.W. and Johnson, R.T. 1981. Structuring learning goals to meet the goals of engineering education, *Journal of Engineering Education*, 221-226.

Smith, K.A. & Waller A.A. 1997. Cooperative learning for new college teachers. In Campbell, W.E. & Smith, K.A. (Eds.). *New paradigms for college teaching*. Edina, MN: Interaction.

Springer, L., Stanne, M. E., & Donovan, S. 1997. Effects of small-group learning on undergraduates in science, mathematics, engineering, and technology: A meta-analysis. Madison, WI: National Institute for Science Education

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