

**article:1257****A Comparison of Group Processes, Performance, and Satisfaction in Face-to-Face Versus Computer-Mediated Engineering Student Design Teams**

The Accreditation Board of Engineering and Technology [1] standards require that “Engineering programs must demonstrate that their graduates have...an ability to function on multi-disciplinary teams.” As a result, team concepts and skills are now taught and practiced throughout engineering course curricula in the United States [2]

Due to the increasingly global nature of engineering, opportunities for students to navigate the issues of distance, time, culture, language, and multiple perspectives associated with *virtual* teams are becoming particularly desirable. In addition to this, industry often requires engineers to work in teams; therefore many university engineering courses ask students to work in groups to complete design projects.

The research question addressed by this study was, “What are the effects of computer-mediated communication on project performance, selected group processes and student satisfaction during students’ experience with virtual teams?”

The method chosen was to require students to work on a team project. Students in a graduate course on the principles of lean manufacturing were randomly assigned to one of two team conditions: face-to-face (F2F) or computer-mediated communication (CMC). The student team project duration was two months and consisted of 25% of the class grade. A total of five surveys were electronically distributed to the participants throughout the semester. In addition to demographic information, participants were asked to respond to questions addressing their perceptions of their progress on the project and overall group functioning. Surveys were completed three times during the semester and once after the project had been completed.

Student teams were compared by final project grades, observable patterns in group processes and member attitudes, and overall reported satisfaction with the team experience. There was no statistically significant difference in the final project scores between the students in the F2F and those in the CMC groups, but the variance of the CMC project scores was significantly greater than the F2F project scores. In order to insure that one group was not markedly different in terms of academic level, the individual GPAs of the students in each condition were compared, which revealed no significant differences. The greater variability in the project scores for the

CMC groups may be an indication that lower performing groups were more affected by the computer-mediated communication than the higher performing CMC groups. Interestingly, the CMC groups felt more of a need to begin the project earlier as evidenced by the fact that the CMC participants reported earlier in the semester than their F2F counterparts that their groups had met at least 12 times or more.

At the end of the semester, subjective comments were gathered from participants on the final project experience through the final on-line survey. Not surprisingly, the sources of satisfaction for the F2F groups were focused on the learning that occurred in a collaborative project, while the CMC focused more on individual skill development. Both the F2F and CMC groups reported ineffective team members as sources of dissatisfaction, but the CMC groups commented that communications technology was also a source of dissatisfaction.

A comparison of student project performance showed that both the F2F and CMC final project scores were comparable; however, there was significantly more variability of scores in the CMC condition. Patterns in group processes indicate that most of the students in the CMC groups were new to the use of technology as an exclusive means of communication and found the experience to be challenging. While the quality of the groups' projects was similar, the perceptions of effectiveness, satisfaction, and peer performance were significantly higher for the F2F groups.

In terms of overall satisfaction, F2F group members were, in general, more satisfied with the team experience than the CMC team members, however, both groups were able to complete the project successfully and reported an overall positive experience. Many CMC team members noted that this experience enhanced their communication skills, increased their awareness of technological challenges facing computer-mediated teams, and provided valuable experience for future job opportunities in industry. As corporations become more global, the use of computer-mediated technology will continue to supplement and may even replace traditional F2F project teams.

Future research involving CMC should continue to examine both performance and social aspects of small group communication. As the tools become more pervasive, the learning curve for CMC groups should also decrease.

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## References

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[2] Mead, P.F., D. Moore, M. Natishan, L. Schmidt, S. Brown, C. Lathan, "Faculty and student views on engineering student team effectiveness," *Journal of Women and Minorities in Science and Engineering*, Vol. 5, 1999, pp. 351-363.

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