

**AC 2007-1565: SOFTWARE FOR STUDENT TEAM FORMATION AND PEER
EVALUATION: CATME INCORPORATES TEAM-MAKER**

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Software for Student Team Formation and Peer Evaluation: CATME Incorporates Team-Maker

Abstract

Last year, a multi-university research team designed a web-based peer evaluation instrument called CATME (Comprehensive Assessment of Team Member Effectiveness) that is simple to use. In a previous, smaller-scale research effort, a group of students and faculty developed a software package called Team-Maker that automates the process of assigning students to teams. The present work incorporates the functionality of the Team-Maker software package into the CATME system. The goal of the integrated package is twofold: 1) to provide a useful tool for faculty to manage teams at their institutions; and 2) to create a high-quality, easy-to-use tool for investigating research questions in engineering education. The poster format is well-suited to showing screen shots of the software interface, promoting discussions of its functionality for managing, studying, and improving the development of students' teaming skills.

Assigning teams using Team-Maker

The basic functionality of the Team-Maker system is to assign students to teams using instructor-defined criteria, including criteria consistent with the cooperative learning literature. First, the instructor decides which attributes of students to measure in assigning teams. Next, students complete confidential surveys to determine their attributes. Finally, the instructor assigns a weighting factor to each attribute and the system assigns students to teams. The purpose of the system is to improve the likelihood that teams will satisfy an instructor's criteria for team formation. The development and testing of Team-Maker is described in [1].

The Team-Maker system provides two web interfaces—one for the instructor and one for students. The instructor's interface is used to create the survey and, once students have completed the survey, to assign students to teams in accordance with an instructor-defined weighting scheme. The student's interface allows each student to complete the confidential survey. Features of the team-assignment system important to forming cooperative-learning teams include: the instructor decides which attributes or skills (e.g., grades in prior courses, GPA, writing skill) are to be distributed heterogeneously across teams; the prevention, if possible, of underrepresented minorities being outnumbered on a team; and matching student schedules such that members of a team have a reasonable expectation of being able to meet outside of class.

To initially test the system, students already assigned to teams by instructors completed the survey. The survey information was entered into the Team-Maker database and teams assigned. The degree to which the team assignments, both automated and manual, complied with the instructors' criteria was compared [2].

Team-Maker has been in use for three years, primarily by faculty at Rose-Hulman Institute of Technology. In 2004-05, the package was made available via "Sourceforge.net", an open-source Internet venue, to give it more publicity and to attract other developers. One such developer has

begun further development of the software including integrating TeamMaker with his own peer-evaluation software, getting it to run on Linux with MySQL, and creating a way for instructors to upload data, such as GPA, into the questionnaire [3].

Peer evaluations using CATME

The CATME system for peer-evaluation and self-evaluation of individual team members incorporates the team-member behaviors shown by research to be important for effective team functioning [4,5,6,7].

The CATME system gathers data from students through a web interface, ensuring the confidentiality of the peer ratings. The system analyzes the data to calculate suggested grade adjustments for equitably distributing a team's grade among the team's members. The system also provides extensive feedback to faculty as to certain dynamics of student teams that can be discerned from the peer evaluation data. The system includes views for administrators, faculty, and students, and has modules for password protection and consent and reporting.

Using the administrator interface, the administrator grants access to the system after confirming that the request has come from a faculty member. The interface shows active and pending faculty accounts, keeps track of each faculty's last login date and time. This interface also provides access to the raw data for surveys released for research purposes.

Using the faculty interface, participating faculty enter information about classes, populate a class with students, populate teams of students within a class, and set up surveys for team activities. The faculty interface also controls the instructions given to the students, the factors surveyed, whether consent is required, and what data will be reported. Faculty select from among five primary survey factors in addition to optional follow-up questions. The five factors are:

- Contributing to the team's work
- Interacting with teammates
- Keeping the team on track
- Expecting quality
- Having task-related knowledge/skills/abilities

Students each receive an email when they are first assigned in the system, so they can set up the system with a password they can remember and make the system secure. A student logs in to find a list of active surveys that they are being requested to complete and a second list of completed surveys where the students can view their results. If a student doesn't complete the entire survey, the interface remembers where the student left off and what data they've already entered. When the students return, they start at the first set of unanswered questions. Since the teams are assigned, the interface shows each student a list of their teammates being evaluated.

When a survey is complete, the faculty member views results in a screen like that shown in Fig. 2. The adjustment factors are computed using an auto-rating system similar to that developed by Brown [8] and can be used by the faculty member to assign individual grades from the group grades (summative use). The ratings also help identify teams and team members having difficulties, providing the faculty member an opportunity to intervene with the team and help

them with conflict resolution, with team members that are “hitchhiking”, or with other unproductive behaviors (formative use).

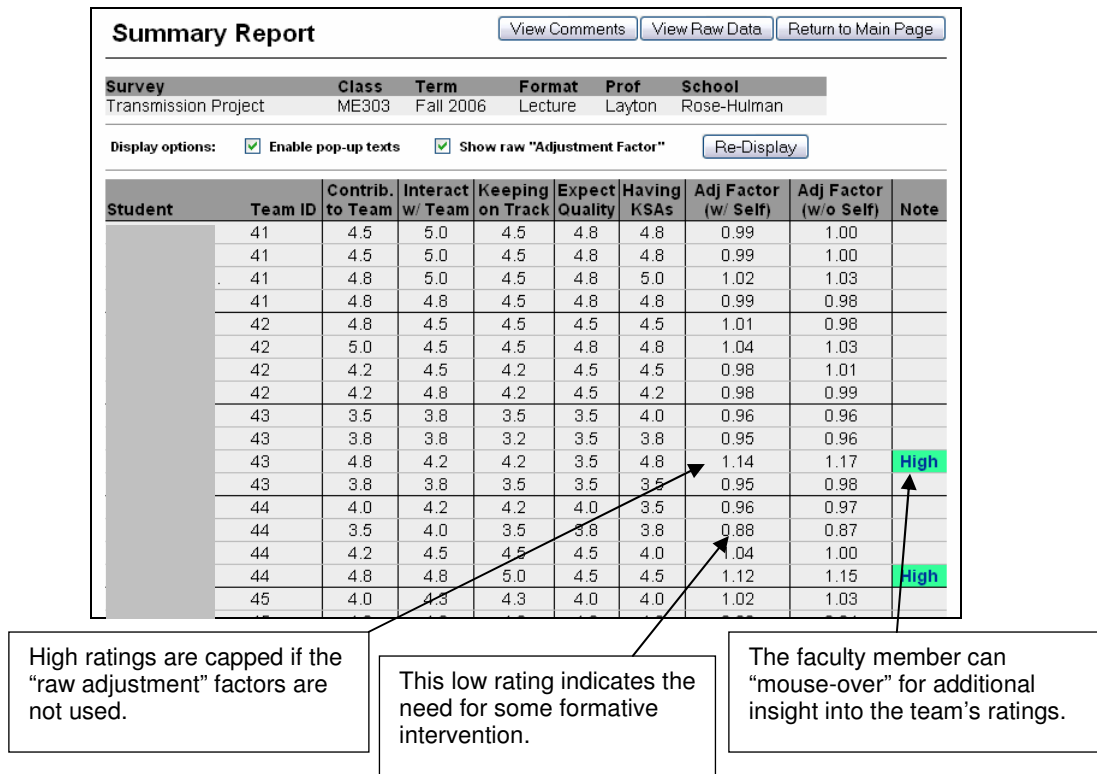


Fig. 2: CATME student peer evaluation results reported to the faculty member.

Utility of the new merged package

In this new work, we incorporate the functionality of the Team-Maker software package into the CATME system. The goal of the integrated package is twofold: 1) to provide a useful tool for faculty to manage teams at their institutions; and 2) to create a high-quality, easy-to-use tool for investigating research questions in engineering education.

This merged package makes it easy for faculty to assign teams and administer peer evaluations in a manner consistent with the precepts of cooperative-learning. Both packages meet the everyday needs of faculty via web interfaces that are easy to understand and easy to use. Moreover, the resulting team assignments have been shown to meet instructors' team-assignment criteria better and more consistently than assigning the teams manually [2] and the peer evaluation instrument has been shown to be simple, reliable, and valid [5].

In addition to the system's utility in the classroom, the system has potential for investigating a wide range of research questions related to the experiences of teams in engineering education. A multi-university team is currently planning to use the combined CATME/Team-Maker system as a tool in conducting the following research:

1. Examine the dynamics of team sizes larger than the common limit of 4-5

2. Investigate the dynamics of virtual teams.
3. Study the dynamics of loosely coupled teams—such as the relationship of the students in a classroom-based community of learning.
4. Conduct research on team assignment criteria, particularly the importance of schedule compatibility, which is not well studied. Schedule compatibility is a specific feature of Team-Maker, making this simple to study.
5. Investigate the influence of social connections (such as fraternal organizations, hobbies or sports) through team formation strategies related to those characteristics.
6. Clarify the effect of having women or underrepresented minorities outnumbered on a team in an engineering context, when this is sometimes unavoidable.

The poster format is well-suited to showing screen shots of the software interface, promoting discussions of its functionality for managing, studying, and improving the development of students' teaming skills.

Acknowledgments

The CATME system was developed with funding from NSF Award No. 0243254, Division of Undergraduate Education (DUE), CCLI-ASA Program. The Team-Maker application was supported by funding from the Mini-Grant Program of the Educational Research and Methods (ERM) Division of the American Society for Engineering Education (ASEE) and with support from Rose-Hulman Institute of Technology.

References

1. Cavanaugh, R., M. Ellis, R.A. Layton and M. Ardis, Automating the process of assigning students to cooperative-learning teams, in proc. *2004 ASEE Annual Conf.*, Salt Lake City (Jun 04).
2. "Criteria and Process for Assigning Teams for Team-Based and Cooperative Learning," In preparation for *Journal of Engineering Education*.
3. Sibley, J., University of British Columbia, personal communication, May 6, 2005.
4. Ohland, M.W., C.J. Finelli, L. Bullard, M. Loughry, and R.A. Layton, Designing a peer evaluation instrument that is simple, reliable, and valid, *NSF Award No. 0243254, Division of Undergraduate Education (DUE), CCLI-ASA Program*, Jun 04-May 07.
5. Loughry, M. L., M.W. Ohland and D.D. Moore (in press), Development of a theory-based assessment of team member effectiveness *Educational and Psychological Measurement*.
6. Ohland, M.W., H.R. Pomeranz and H.W. Feinstein, The comprehensive assessment of team member effectiveness: A new peer evaluation instrument, in proc. *ASEE Annual Conf.*, Chicago (Jun 06).
7. Loughry, M. L., M.W. Ohland and D.D. Moore, Behaviorally anchored peer evaluation of team member effectiveness, in proc. *Annual Meeting of the Southern Management Association (2006)*.
8. Brown, R.W., Autorating: Getting individual marks from team marks and enhancing teamwork, in proc. *Frontiers in Education Conf.*, IEEE/ASEE, Pittsburgh (Nov 95).