Assessing Teamwork Skills for Assurance of Learning Using CATME Team Tools

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ABSTRACT

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Colleges of business must meet Assurance of Learning (AOL) requirements to gain or maintain AACSB accreditation under the new standards adopted April 8, 2013. Team skills are among the most important skills desired by recruiters, yet employers and scholars perceive that team skills are frequently deficient in college graduates. This paper describes how a set of free web-based tools available at www.CATME.org allows colleges to collect data to determine whether their students are developing good team skills and demonstrate achievement for accreditation reviews for learning goals related to team skills. The tools, which were developed to support teamwork in college classes, allow instructors to easily collect, interpret, and share data about students and teams. We show how colleges that use the CATME system in all courses requiring teamwork could analyze the data to demonstrate that their programs develop students' team skills. The appendix provides thirteen examples of learning goals colleges could use, along with a method to demonstrate achievement for each, and a sample measurable program target. These examples relate to team skills such as working with teammates of diverse backgrounds, contributing effectively to teams, displaying good interpersonal skills, being able to evaluate teamwork, and recognizing team processes and outcomes.

Teamwork skills are essential for graduates of business schools, yet many colleges of business do not have a feasible way to assess whether their students are learning to work effectively in teams. This paper describes how a set of free web-based tools available at www.CATME.org can be used as part of a systematic assessment of a program's effectiveness in developing students' team skills. The CATME name originated with an instrument for self and peer evaluation, called the Comprehensive Assessment of Team Member Effectiveness, which was the system's first tool. Other tools were added to help instructors manage student teams more effectively and efficiently, but the system still uses the CATME name.

This paper describes how, if colleges would use the CATME system in all classes that require teamwork, colleges could improve opportunities for student learning. With the data collected by the system, colleges could document that students are getting an appropriate number of team experiences and that those experiences are leading to the development of team skills.

AACSB ACCREDITATION

Developing learning goals for a college's programs and measuring whether students are achieving those goals is necessary to gain or maintain accreditation by AACSB International, the Association to Advance Collegiate Schools of Business. AACSB accreditation is a vital indicator of quality for many colleges of business, particularly the 672 institutions that had AACSB accreditation as of April 2013 (www.aacsb.edu). AACSB requires the faculties at business schools to define learning goals for their programs that are consistent with the colleges' missions and objectives, then measure student outcomes related to those goals. Colleges must ensure that their curricula are appropriate for achieving their learning goals. Guidance for conducting particular aspects of program assessment can be helpful (Bacon, 2003; Gardiner, Corbitt, & Adams, 2010). This paper provides guidance for learning goals relating to teamwork.

AACSB adopted new accreditation standards on April 8, 2013. Under the new rules, Standards 8 – 12 pertain to learning and teaching. Although there is no uniform set of learning goals required of all schools, the new standards do include a number of requirements that accredited institutions must meet that relate to developing students' team skills.

Standard 9 states that bachelor's degree programs and higher "would normally include learning experiences that address the following general skill areas ... Interpersonal relations and teamwork (able to work effectively with others and in team environments)." (AACSB, 2013 Eligibility Procedures, pp. 30-31). The list of general skill areas also includes other skills that would be developed or practiced with team learning methods, including "Written and oral communication," "Diverse and multicultural work environments (able to work effectively in diverse environments)" and "Reflective thinking (able to understand oneself in the context of society)" (pp. 30-31). Based on these parts of Standard 9, it appears that it will be necessary for accredited business schools to ensure that their graduates have good team skills and the types of communication skills, interpersonal skills, ability to work with diverse people, and ability to understand oneself in the context of working with others that can best be achieved by working collaboratively. The guidance for documentation for Standard 9 instructs institutions to "Describe learning experiences appropriate to the areas listed in the basis for judgment including how the areas are defined and fit into the curriculum" (p. 32). Therefore, colleges will need to find ways to document the places in the curriculum where students are participating in team experiences. It is not known how many AACSB-accredited business schools currently have learning goals pertaining to teamwork because AACSB does not keep a record of schools' learning goals, nor does it require accredited colleges to make their learning goals publicly

available (Jane Lawler, Manager, Accreditation and Member Services, AACSB International, personal communication December 8, 2011).

Standard 10 states that "For any teaching/learning model employed, students have opportunities to work together on some learning tasks and learn from each other." (p. 32). The guidance for documentation for Standard 10 states that schools should "Describe how curricula include opportunities for student-student and student-faculty interaction to facilitate learning across program types and delivery modes" (p. 32), "Summarize how student-student and student-faculty interactions are supported, encouraged, and documented across program types and delivery modes" (p. 33), and "Document how student-student and student-faculty interactions are assessed for impact and quality across program types and delivery modes" (p. 33). These parts of Standard 10 would require colleges to not only document the existence of opportunities to develop team skills, but also to show that they exist across program types and delivery modes, which, for many institutions, would include on-line courses. These elements of Standard 10 would also seem to require colleges to document that the peer learning opportunities are of high quality and impact student learning.

Standard 11 requires that colleges "Demonstrate that expectations across educational programs that result in the same degree credentials are equivalent, regardless of delivery mode, location, or time to completion" (p. 34). Because of this standard, colleges that use part-time programs or on-line delivery will need to document that students in these programs have opportunities to learn team skills comparable to those in full-time programs on campus. The web-based CATME system works for all delivery types and can facilitate these comparisons.

Later in this paper, we will discuss how using the CATME system in all courses that require teamwork could help colleges meet these elements of the new accreditation standards.

However, we will first describe why, apart from accreditation requirements, business schools would be interested in building their students' team skills. Demonstrating good team skills is critical for graduates to compete for jobs upon graduation and to succeed in business careers. Furthermore, many recruiters and academics agree that team skills are a common deficiency among college graduates. This suggests that business schools will be searching for better ways to ensure that their programs and teaching result in students developing strong team skills.

IMPORTANCE OF DEVELOPING STUDENTS' TEAM SKILLS

Recruiters Seek Employees with Strong Team Skills

Teamwork and related skills that are developed in group contexts are often called "soft skills." Soft skills are often more difficult to train and measure than technical skills, yet they top of the list of competencies that recruiters desire when they hire college graduates (American Management Association, 2010). Today's traditional-age undergraduates, as compared to previous generations of students, may have less experience, and therefore less-developed social skills for working face-to-face with others, because they have grown up using technologies like Facebook, texting, and e-mail to communicate (Kirk, 2005, p. 95). The Job Outlook 2012 survey, conducted by the National Association of Colleges and Employers, found that the "ability to work in a team structure" was the highest-rated skill that recruiters are seeking in college graduates. Other surveys put it near the top. In a survey of recruiters who hire undergraduate students from U.S. business schools, which gathered data from all types of colleges throughout the country, the ability to "work effectively within teams" was rated very important by 90% of recruiters (Calloway School, 2004). The survey found that team skills rated third in importance after "communication and interpersonal skills" and "leadership skills and potential," which are also soft skills that would tend to be developed by working collaboratively.

In addition, the competencies that ranked fourth through seventh on the survey would also be frequently developed by working in groups. These were: "analytical and critical thinking skills," "adaptability, including the ability to deal with ambiguity," "people and task management skills," and "self-management skills." Other surveys show that recruiters of MBAs are looking for the same skills, with "communication and interpersonal skills," "ability to work well within a team," and "analytical and problem-solving skills" coming in first, second, and third in MBA recruiters' wish lists (Alsop, 2002; The Wall Street Journal/Harris Interactive Survey, 2002).

Organizations' demand for employees with strong team skills and other soft skills that can be acquired by group work is growing. This is because organizations increasingly use work processes and control systems that rely more on lateral coordination than close supervision and central coordination (Loughry & Tosi, 2008). In an economic environment that is increasingly complex, rapidly changing, and global, collaboration is often required within and across teams, organizations, and industries. Work teams, committees, trade associations, strategic alliances, and joint ventures all require people to work together, usually without hierarchical authority, to achieve common goals. This requires managers and employees who have the knowledge, skills and abilities (KSAs) to work together effectively (Salas, Sims, & Burke, 2005).

Team Learning Methods Facilitate Learning

In addition to meeting the demand for graduates with appropriate KSAs, teaching with teams also achieves pedagogical goals, such as making students active participants in their education (Loyd, Kern, & Thompson, 2005). Cooperative learning (Kaufman, Felder, & Fuller, 2000; Felder & Brent, 2001), collaborative learning (Dillenbourg, 1999), experiential learning (Kolb & Kolb, 2005), active learning (Johnson, Johnson, & Smith, 2006), action learning (Raelin, 2006), and business simulations (Zantow, Knowlton, & Sharp, 2005) typically rely on

groups of students working together. Team learning experiences can build students' emotional

intelligence (Moriarty & Buckley, 2003), and displaying better teamwork behaviors helps

student teams to perform better and achieve their goals (Deeter-Schmelz, Kennedy, & Ramsey,

2002).

Third generation learning and development models propose that knowledge is

constructed through social interactions (Kraiger, 2008). In other words, people learn material

more effectively if they learn it in a way that allows them to interact with other people. This

suggests that educating students using team learning methods could help students to learn course

content better in all subjects, in addition to producing graduates with better teamwork and

collaboration skills. Both of these will help graduates to be more successful in their careers. In

fact, general education scholars are recognizing that teamwork is among the most essential

learning outcomes for college students in all disciplines, both because it facilitates other learning

and because employers in most fields value teamwork (Hughes & Jones, 2011).

Business Programs Frequently Do Not Sufficiently Develop Students' Team Skills

Many instructors recognize the pedagogical benefits of group-based learning and the

need for students to develop team skills, and are integrating team activities into their classes

(Boni, Weingart, & Evenson, 2009; Michaelsen, Knight, & Fink, 2004). In a survey of

instructors at 4-year institutions, 59.1% reported that they use small groups in all or most of their

courses (The Chronicle of Higher Education, 2009). However, many instructors simply assign

groupwork and do not provide guidance for working effectively in teams, which Vik (2001) calls

a "sink-or-swim" approach. As a result, the quality of students' team experiences is often not as

good as it could or should be (Pfaff & Huddleston, 2003). Student teams should be formed

appropriately and have positive interdependence, individual accountability, and group

processing, which means that instructors and students set goals for team behavior and monitor the teams' and members' progress toward meeting them (Cottell & Millis, 1992).

Even though team learning methods are widely used, employers repeatedly cite teamwork as a key skill deficiency among college graduates entering the workforce (Hart Research Associates, 2006; Vance, 2007). A survey conducted in the Fall of 2009 showed that 71% of employers of college graduates felt that colleges should place more emphasis on developing students' "teamwork skills and the ability to collaborate with others in diverse group settings" (Hart Research Associates, 2010, p. 9). Scholars agree that "teamwork competencies and skills are rarely developed" (Chen, Donahue, & Klimoski, 2004, p. 28).

Challenges to developing team skills. There are a number of reasons why students may not develop good team skills. There are also substantial challenges for colleges and instructors in helping students to learn team skills, even when they provide opportunities for students to work in teams. Students frequently struggle with or resist teamwork. They often divide the project and perform the pieces independently, and experience poor communication or conflict (e.g., Burdett, 2003; Oakley, Felder, Brent, & Elhajj, 2004; Verzat, Byrne, & Fayolle, 2009). Some students prefer to work alone, dislike group work, and lack interpersonal skills (Shankar & Seow, 2010). Social loafing is commonplace in student teams, which means that loafers get through ostensibly team-based activities without gaining significant teamwork experience (McCorkle et al., 1999). Unless the grades of poor team contributors are substantially penalized, group activities reward free-riding because students get credit without doing work (Fellenz, 2006). Therefore, when most instructors use group projects without monitoring group contributions, students who social loaf are repeatedly rewarded, which could decrease, rather than enhance, the team skills of students who are willing to take advantage of their teammates.

Training business students in teamwork may encourage them to use more effective team processes, resulting in better teamwork experiences (Bacon, Stewart, & Silver, 1999). This could take the form of a teamwork course built into the business school curricula. This may not be feasible for some colleges, though, because the program of study is already full with other courses or because colleges do not have faculty who would be able to create and deliver a quality course on teamwork. Integrating shorter teamwork lessons into multiple courses that employ group-based learning methods would be another option. Some instructors, however, may feel that they do not have the skills to teach even short lessons on teamwork (Bryant & Albring, 2006), or they may not want to use class time to teach teamwork instead of other course content.

Peer evaluations. Using peer evaluations to hold students accountable for their team contributions is one technique that has received empirical support. Peer evaluations create accountability to teammates and provide an incentive for displaying good interpersonal skills and contributing effort to help the team achieve its goals (Hernandez, 2002; Millis & Cottell, 1998). Individual accountability is necessary for proper implementation of team-based learning methods, but it is frequently missing in business school group projects, which can reduce student learning (Bacon, 2005). In addition to creating accountability, peer evaluations make students aware of how their peers perceive them, which can lead to greater self-awareness and facilitate learning (Mayo, Kakarika, Pastor, & Brutus, 2012).

Students learn about team skills from the process of completing self and peer evaluations (Dominick, Reilly, & McGourty, 1997; Thomas Martin, & Pleasants, 2011). Completing self and peer evaluations also gives students experience with multi-rater systems, which are common in work organizations, yet tend to make students uncomfortable (Druskat & Wolff, 1999; Hooijberg & Lane, 2009). Research has shown that student attitudes toward group work are

more positive when peer evaluations are used (Chapman & van Auken, 2001). Familiarizing students with the peer evaluation instrument before they begin working in teams shows students what team-member behaviors are expected and what behaviors are to be avoided, and can help teams develop shared expectations for team members (Ohland et al., 2012).

Two recent empirical studies have demonstrated learning benefits from using a standardized on-line peer evaluation instrument. Brutus & Donia (2010) showed that using a consistent on-line peer evaluation system across courses improved students' team skills. The peer evaluation system was developed internally at the Canadian university where the study was conducted (it was not the CATME system). Brutus & Donia used a "within-subject design with a matched comparison group…to tease out maturation effects or the possibility that students improve their group-related skills naturally" (p. 656). They found teammates' satisfaction with students' performance on the team project at Time 2 was both higher than ratings of the same students at Time 1 and also higher than the Time 2 ratings of comparison-group students who had participated in the Time 1 groupwork without using the peer evaluation system.

Brutus, Donia, and Ronen (2013) then showed that using the online peer evaluation system made students more confident at rating teammates' performance as a team member and more confident in their ability to communicate peer performance. Students who had previously used the peer evaluation system also included more specific comments about teammates' performance than raters in the control group who had not previously used the system.

In their study of peer feedback on leadership competencies, Mayo and colleagues write: "our results suggest that receiving feedback from peers increases self-awareness. To the extent that heightened self-awareness represents a positive educational outcome, business schools would benefit from the implementation of systematic peer-evaluation systems

within their educational programs. Recently, Brutus and Donia (2010) commented on the fact that, while peer evaluations are very common in business schools, they are most often embedded within individual courses as opposed to being standardized across the curriculum. Individual development through feedback is optimized when students receive feedback over time in a standardized format" (Mayo, Kakarika, Pastor, & Brutus, 2012, pp. 642-643).

Twin goals for accredited institutions. AACSB-accredited colleges of business face two challenges. One is delivering programs that actually enhance students' team skills. The other is creating learning goals related to team-skill development for which it is possible to document student achievement. The CATME system has features that facilitate both of these.

HOW CATME TEAM TOOLS CAN FACILITATE ASSURANCE OF LEARNING

The CATME system, accessible at www.CATME.org, includes three tools that business schools can use to demonstrate achievement on learning goals related to teamwork. These are Team-Maker, CATME Peer Evaluation, and Rater Calibration. All were developed with financial support from the National Science Foundation and have been free for use in higher education since their release.

Work on the project began in 2003 and the first web-based tool, CATME Peer Evaluation, was deployed in October 2005. Since then, additional tools and enhancements have been added and use of the system has increased rapidly, mostly by word-of-mouth (see Figure 1). More than 3,300 instructors at nearly 700 institutions in 50 countries have used the system with over 150,000 unique students. A redesigned website (www.CATME.org) was deployed in December 2012 with additional information and tools, including information about data security, maps and lists of user institutions, a history of the system development, and a list of academic

publications and presentations about the system. CATME Meeting Support tools were also added to help students hold more effective team meetings. A teamwork training program that uses video demonstrations is in development.

General features of the system and how they facilitate assessment are described next. Afterward, the features of each tool are described, along with suggestions for using them to demonstrate a program's achievement in developing students' team skills. Appendix A provides examples of learning goals that could be assessed using the CATME system.

CATME System Features

CATME team tools allow instructors to confidentially collect information from students in an easy-to-use, secure web-based system. Instructors can access this information, along with additional data that the system computes from student and team data, until they choose to delete it. Instructors can also copy the data into an Excel spreadsheet and save it on their personal computers. Therefore, the data are easy to retain for AACSB documentation.

To begin using the system, instructors request an account at www.CATME.org. A member of the CATME support team verifies that the person requesting an account is an instructor at the university listed on the account request, then sends the instructor an e-mail (usually within 24 hours) that contains a link to create a password. The instructor logs in and inputs the course name for which they wish to use the system. The instructor then uploads a spreadsheet containing the students' names, e-mail addresses, and identification numbers of students registered for the course. To use the system in multiple courses, instructors just add courses, which all appear on the "instructor dashboard" in CATME.

At most institutions, students take multiple courses that require teamwork, often spread throughout their program of study. If all instructors who have a teamwork component to their

course use the CATME system, this creates a complete set of data on students' team performance history for the variables that instructors chose to include. If instructors share this data with assessment officers, they can use it to evaluate students' performance across courses and across semesters, providing documentation of each major team-learning opportunity that the business program provided for each student.

The CATME system allows instructors to delegate access to other members of the faculty so they can view the CATME information for that course. This feature was created for instructors who team teach classes or use teaching assistants. However, colleges of business could use this feature to enable the assessment officer responsible for the learning goals pertaining to teamwork to retrieve data directly from the system. Instructors would click a button to delegate access and select the assessment officer. The assessment officer could then compile the data from all courses using teamwork. This would allow the assessment officer to provide evidence of team experiences for assurance of learning documentation. Compiling the data from all instructors would also allow the assessment officer to perform additional analysis to evaluate the business program's effectiveness at developing students' team skills. This would help schools comply with AACSB Standards 8-10.

Team-Maker

The tool in the CATME system that many instructors use first is Team-Maker, which collects information from students and uses it to assign students to teams according to instructor-specified criteria. The algorithms that Team-Maker uses and evidence for the tool's validity is described in Layton, Loughry, Ohland, & Ricco (2010). This research found that Team-Maker could form teams that met specified criteria more closely than an experienced instructor could. Computer-aided assignment is an alternative to other common methods of assigning students to

teams, such as allowing students to select their own teams, random assignment, and teacher-assignment, which each have strengths and weaknesses (Bacon, Stewart, & Anderson, 2001; Bacon, Stewart, & Silver, 1999).

To use the tool, instructors click a button to use Team-Maker in their class, then click on each question they want to ask students. Instructors can choose from a library of questions or write their own questions. The library includes questions about students' demographics (gender, race, and age), college experience (class year, major, membership in a sorority/fraternity or sports teams), schedule (times available for meeting with teammates, preference for weekend meetings, commute, total credit hours, and hours worked on a job), preferences related to teamwork, and perceived skills in a number of areas. A comments field allows students to make confidential comments to the instructor.

Students sometimes have strong preferences for having or avoiding certain students as teammates (Chapman, Meuter, Toy, & Wright, 2006) and the comments feature in Team-Maker makes it easy for them to make special requests. Instructors can choose to grant or ignore these requests. Although sometimes self-selected teams are among students' best team experiences, they are frequently among students' worst team experiences, and students tend to select teammates that make the teams overly homogeneous (Bacon, Stewart, & Silver, 1999; Feichtner & Davis, 1984). An advantage of the Team-Maker system is that assessment officers or instructors can track the characteristics that are associated with team success in their schools and make decisions about which criteria to use to form teams based on an analysis of past data.

Instructors can view the data that students submit at any time. After the due date that the instructor specified for students to answer the questions, the instructor forms teams. Instructors do not have to use all of the collected information when forming teams. They click the "ignore"

button next to a variable name if they do not want to use it to form teams. The system allows instructors to weight the variables used for team assignment to prioritize criteria they feel are most important. For most variables, instructors can instruct Team-Maker to group students heterogeneously (spread students with this characteristic across teams) or homogeneously (form teams of students who are alike on this characteristic).

Instructors can also create special constraints, such as forming groups entirely comprised of certain students, making sure that certain students are assigned to the same team, or ensuring that certain students are not on the same team. If an instructor has more than one team activity during the semester, they can use a feature to re-make teams so they have no overlapping membership with the first set of teams. This allows instructors to ensure that students work with different people and to document the experiences for their learning goals. For example, to meet the new AACSB requirements that students are "able to work effectively in diverse environments" (AACSB, 2013 Eligibility procedures, p. 31), colleges might create a learning goal that students would work with people of diverse backgrounds. The instructor could then instruct Team-Maker to assign students heterogeneously to teams based on gender, race, age, and disciplinary background. The program would then try to create diversity within teams for these variables. The instructor could then form new teams with similar criteria for another portion of the semester and allow students to work with a different set of diverse teammates.

The Team-Maker program assigns students to teams and then displays statistics showing how well each team meets the instructor-specified criteria on each variable. Team-Maker distributes a given set of students, those who happen to be in the class, among teams. It cannot create teams that meet the instructor's preferences if the students in the course lack those characteristics. It is often easier for Team-Maker to match instructors' preferences for more

criteria in large classes than in smaller ones. In small classes, forming teams that meet the instructor's preferences well on some criteria could force Team-Maker to compose teams that fail to match on other criteria. The weighting feature allows instructors to specify which criteria are more important. Furthermore, if instructors do not like something about the resulting teams, they can change the weighting or the variables and re-make teams. This takes less than a minute in typical class sizes, slightly longer in huge classes (the system can handle courses with thousands of students). In the example given in the previous paragraph, the results would display the degree to which each team had diversity on gender, race, age, and disciplinary background. Team-Maker then stores the information about the students and teams.

After instructors are satisfied with the teams, they can release the team information to students. The Team-Maker system generates an e-mail to each student that includes the names and e-mail addresses of their teammates. If students are surveyed regarding their schedules, the system also includes a schedule compatibility grid that shows the times when students on the team indicated they are available to meet.

Assessment officers who collect data from all courses requiring teamwork could analyze the Team-Maker data to show the cumulative effect of students' group experiences. Continuing with the diversity example, they could show how many times during their program of study students worked with teammates of different gender, race, age, and disciplinary background.

Assessment officers could also analyze the Team-Maker data to examine the characteristics of students and teams that performed well or poorly on teamwork, or see which students show evidence of having good team-skill development, or those who are having problems working in teams. For example, students who took a particular course in which teamwork was emphasized might have better teamwork ratings in subsequent courses. This

would require combining data from Team-Maker and CATME Peer Evaluation, and perhaps team grades from instructors, but it would provide useful programmatic information so that the assessment process could "close the loop" by making necessary changes to the curricula. Using evidence to determine whether learning goals are being met and making changes in the program if goals are not being met is necessary to meet the requirements of AACSB's Standard 8.

CATME Peer Evaluation

CATME Peer Evaluation is a tool for self- and peer evaluation of team members' contributions to the team. The instrument collects self and peer ratings on five dimensions of team-member contributions that were developed based on the teamwork literature and original empirical research.

Loughry, Ohland, & Moore (2007) reviewed the literature on team-member behaviors that affect team performance and used it to develop a large pool of potential items for a Likert-style peer evaluation instrument. They then conducted two studies to select the items. They created an 87-item long version and 33-item short version instrument that measured five broad ways of contributing to the team. The resulting dimensions of team-member contributions are: contributing to the team's work, interacting with teammates, expecting quality, keeping the team on track, and having relevant knowledge, skills, and abilities. The instrument was called the Comprehensive Assessment of Team Member Effectiveness (CATME).

Ohland et al. (2012) then developed a behaviorally anchored rating scale (BARS) version of the same five dimensions of team-member contributions identified in the Loughry, Ohland, and Moore (2007) study. Although empirical research on BARS rating formats has been mixed (Baker, 2008; MacDonald & Sulsky, 2009), among the advantages of BARS scales are that they provide specific descriptors of observable behaviors at different levels of performance, which

may reduce rater ambiguity about what rating is appropriate, and they have more face validity than Likert-scales. A major advantage of the Ohland et al. instrument is that it only requires five ratings of each team member, versus 33 with the short form of the Likert-style instrument. The Ohland et al. paper reported the results of three studies. These demonstrated the equivalency of the BARS instrument to the Likert-style version of the instrument and convergence with another peer evaluation instrument. In addition, ratings on the five dimensions of the instrument had different relationships with measures of how much the rater liked the team member and would want to work with the teammate again. The CATME dimensions *contributing to the team's work* and *interacting with teammates* were significant predictors of whether the rater would want to work with the team member again.

Ohland et al. (2012) provided initial psychometric evidence for the CATME peer evaluation system. Here we present more recent data, which also provide strong support for the reliability of the peer evaluation data. Specifically, we analyzed peer evaluation ratings from 53,608 students nested in 8,002 teams (mean number of raters per target = 3.46, SD =.74) at 180 institutions that have used the CATME Peer Evaluation system. We focused on the level of interrater agreement across team members. This agreement is often assessed with two measures – ICC(1) and ICC(2) (Bliese, 1998, 2000). ICC(1) describes the amount of variance in a variable that can be attributed to belonging to the higher-level unit (e.g., team) (Biemann, Cole, & Voelpel, 2012). ICC(1) also indicates the degree to which the value for any one member of the unit can serve as a reliable estimate of the aggregated variable (Bliese, 1998). ICC(2) provides an estimate of the reliability of the higher-level unit's group means within a sample (in our case, the class in which each team was nested). It adjusts ICC(1) for group size; therefore, values of ICC(2) are higher when there are more lower-level observations per higher-level unit (e.g., more

team members per group) (Klein & Kozlowski, 2000). Results indicated that across the five

CATME peer evaluation dimension ratings, mean ICC(1) values ranged from .44 to .50 and

mean ICC(2) values ranged from .69 to .74. This translates into a level of interrater agreement

(e.g., ICC(2) estimates) for the CATME peer evaluation dimension ratings of approximately .71

for a typical 3- member team and .80 for a typical 5-member team.

To use CATME Peer Evaluation, instructors who have set up a class in the CATME

system click a button to select Peer Evaluation. Instructors who used Team-Maker in the class

click on a drop-down menu to use those team assignments for the peer evaluation. If Team-

Maker was not used, the instructor uploads a spreadsheet containing students' names, e-mail

addresses, student identification numbers, and team names. The system then walks the instructor

through a simple set-up process that takes about one minute. During this process the instructor

can choose to customize the instructions and decide what questions, if any, to ask students from

the system's library of optional follow-up questions. On the date specified by the instructor, the

system sends students an e-mail asking them to log in and complete the self- and peer-evaluation.

When students log in, they see their name and their teammates' names above a set of

behavioral descriptions for high, medium, and low performance on the dimension of team

contribution to be rated. Only one dimension at a time is displayed, so if the instructor assigned

all five dimensions of team-member contribution, students work through five screens to

complete the evaluation. Figure 2 shows an example of the first of these screens, which is the

rating form for *contributing to the team's work*. Students click a radio button next to the

description that best matches how the team member behaved. At the end, students see the

comments box. Comments can only be viewed by the instructor and other faculty that the

instructor designates; the comments cannot be released to students. Instructors can ask students

to justify their ratings in the comments field in order to increase accountability for providing accurate ratings (Mero, Guidice, & Brownlee, 2007). Students can also use the comments field to tell the instructor about any problems or concerns they have, or that the team is doing well.

The system analyzes the ratings data and displays many statistics for instructors, including a grade adjustment factor, which reflects the relationship between each student's ratings and the team average rating. The system also flags a number of "exceptional conditions" that alert instructors to students or teams that may warrant attention. Exceptional conditions pertaining to individual team members are high performers, low performers, underconfident or overconfident students (based on a comparison of self-ratings to peer ratings), and "manipulator," which flags students who give themselves high ratings and assign low ratings to all of their teammates (instructors must talk with the student to learn whether the student really did have all poor teammates or was trying to game the rating system). Team-level conditions flagged by the system are teams that appear to have divided into cliques and ratings that suggest team conflict.

Three features of the CATME Peer Evaluation tool make it useful for implementing best practices based on research. This is important because some research has suggested that poorly conducted peer evaluations can actually undermine team performance (Bacon, Stewart, & Silver, 1999). One feature of CATME Peer Evaluation is that the ratings and comments are confidential but not anonymous. Instructors see how each team member rates every other team member, but students cannot see this level of detail. Research shows that raters will be more honest when peer ratings are confidential, but that ratings should not be anonymous so that team members can be held accountable to justify their ratings (Bamberger, Erev, Kimmel, & Oref-Chen, 2005). In a common practice that research would suggest avoiding, some instructors use paper and pencil

peer evaluations, which they often ask students to complete while seated next to one another in a classroom. The privacy provided by CATME's web-based system avoids this problem.

A second feature of the CATME Peer Evaluation system that makes it useful for following research-based guidance for building students' team skills is that it allows instructors to release feedback to students (Gueldenzoph & May, 2002). After the due date for students to complete the self and peer evaluations has passed, instructors look at the data and decide if they want to release the results. When the instructor clicks the button to release the peer evaluation data, students receive an e-mail inviting them to log in and view the results. Students see a visual display of their self-rating, the average rating that their teammates gave them, and the team average rating for each of the five ways of contributing to the team. Instructors can also choose to have the feedback system display suggested ways to improve in each dimension (based on the Loughry et al., 2007 study), so that students know how to try to improve their ratings.

A third feature of the CATME Peer Evaluation system that makes it useful for implementing research-based guidance is that it is very easy to collect multiple rounds of self- and peer-evaluation data and distribute feedback to students repeatedly during term-long projects. Instructors may choose to use one or more administrations for formative (developmental) purposes and provide feedback that does not affect students' grades, followed by one or more administrations for summative use that will affect students' grades to create accountability for team contributions (Gueldenzoph & May 2002). This contrasts with the common practice of using peer evaluations only once at the end of a term, which does not provide students with feedback while they still have an opportunity to improve their team contributions. Providing feedback followed by opportunities for students to improve teamwork skills in subsequent time periods can help students to learn better team skills over the course of

the term (Fellenz, 2006; Hess, 2007). Furthermore, using the self- and peer-evaluation system at multiple points would provide structured opportunities for students to reflect on their own performance as team members and facilitate discussions within the team about team processes and how all members of the team are behaving. Repeated administrations of peer feedback provide the time that students need to absorb the feedback and develop self-awareness (Mayo, Kakarika, Pastor, & Brutus, 2012). This may enhance self-regulation and encourage team members to discuss problems with one another, which tends to improve students' satisfaction with the team and may improve team performance (Lancellotti & Boyd, 2008). Repeated administrations of peer evaluations with a standardized instrument also build students' confidence at rating their teammates and improves the quality of their peer evaluations (Brutus, Donia, & Ronen, 2013).

The CATME Peer Evaluation data can provide information to demonstrate achievement for learning goals related to developing team skills. Higher ratings indicate better team skills, so faculties could develop a standard for what would be considered good peer ratings as indicators of strong team skills. High peer ratings on CATME's second dimension, "interacting with others" would indicate good interpersonal skills. A student's level of rating agreement with other team members about the level of another team member's team contributions would be an indicator of the student's ability to accurately rate teamwork. Agreement between self-ratings and peer ratings would indicate that students were developing an ability to reflect on their performance and judge their own teamwork contributions (Dochy, Segers, & Sluijsmans, 1999; Mayo, Kakarika, Pastor, & Brutus, 2012).

The CATME Peer Evaluation tool has eight sets of optional follow-up questions that instructors can use to gather additional information about students' team experiences. These

include follow-up questions about team members' willingness to work with these teammates again (Ohland et. al., 2012), and how much they like each teammate and consider him or her to be a friend (Jehn & Mannix, 2001). The other scales that faculty can choose to administer after a peer evaluation survey ask about the team experience and team processes, including team conflict (Jehn & Mannix, 2001), team satisfaction (Van der Vegt, Emans, & Van de Vliert, 2001), team interdependence (Van der Vegt, et al., 2001), team cohesiveness (Carless & de Paola, 2000; Loughry & Tosi, 2008), peer influences (Loughry & Tosi, 2008), team transition processes (Marks, Mathieu, & Zaccaro, 2001), and team action processes (Marks, et al., 2001).

Because in both academic and work contexts self-ratings are often inflated (Heidemeier & Moser, 2009; Inderrieden, Allen, & Keaveny, 2004) and teammates sometimes assign higher peer ratings than warranted due to social pressures (Mero, Guidice, & Brownlee, 2007; Saavedra & Kwun, 1993), analyzing some of the optional team-level variables can provide data about whether teams that include a particular member tend to have better or worse outcomes. If a program of study offers students many teamwork opportunities in different classes, team-level data with different combinations of team members, in different subjects, with different task requirements would be available for analysis. These data would provide a good mix of contexts in which students could display their team skills. The pattern of results could provide evidence for students' effectiveness working in teams. For example, students whose teams consistently experience high conflict and low satisfaction, cohesiveness, and interdependence probably have not developed strong team skills. However, team-level data that are consistently positive would provide evidence that the student is functioning effectively in a variety of team contexts.

It should be noted that there are many non-computer-based alternatives to using the CATME Peer Evaluation system. Baker (2008) reviewed typical approaches to self and peer

evaluation with student groups. Rating scales, point distributions, and peer nominations or comparisons are the most common approaches. Project diaries were used in one study that Baker reviewed. Baker also noted that some instructors specify that students must not give all team members the same rating. Others have described multifaceted approaches to managing groups that are generally more time consuming for instructors (e.g., Fellenz, 2006; Michaelsen, Knight, & Fink, 2004; Willcoxson, 2006). Another approach is to allow teams to develop their own evaluation criteria. Instructors can also observe teams or meet individually with teams to evaluate team members' contributions, although this is very time consuming, particularly for large classes. Finally, it is very common for instructors to use teams without using any form of peer evaluation or formal collection of data about team processes (Vik, 2001).

An anonymous reviewer raised the question of whether peer evaluations would be direct or indirect assessments of students' teamwork for purposes of AACSB accreditation. We contacted Dr. Jerry Trapnell, who was AACSB's Chief Accreditation Officer until his retirement in September 2012. His opinion was that for learning goals pertaining to teamwork, students' assessment of the contributions of other team members is a direct assessment (personal communication April 23, 2013). He said "if the performance dimensions are articulated and appropriate rubrics are developed and used, then the students' assessment of the performance of fellow teammates as team members (i.e., doing their fair share, attending team meetings, participating in team activities, etc.) is, in my opinion, a direct assessment and appropriate."

Rater Calibration

The CATME system's Rater Calibration tool allows instructors to require students to practice rating fictitious team members using the CATME Peer Evaluation instrument before they are allowed to rate their actual team members. Students view the fictitious team members'

descriptions and rate them on the five dimensions of CATME Peer Evaluation. Students then see a visual display of the rating scales marked with the student's ratings and the correct ratings, along with the portion of the team-member description that warrants the particular ratings.

Using Rater Calibration ensures that students are familiar with the rating criteria and know how to use CATME's behaviorally anchored rating scales correctly. Using the Rater Calibration before teams begin working also shows students what team-member behaviors are expected and what team-member behaviors should be avoided in order to earn good ratings. This is useful because having a well-designed peer-evaluation instrument and familiarizing the students with the instrument before they begin working as a team not only teaches students how to evaluate team-member contributions, but it also teaches them which teamwork behaviors are important (Young & Henquinet, 2000).

Using the rater calibration feature with all students in a college can facilitate assurance of learning in two ways. First, requiring all students do Rater Calibration before working in their teams provides a simple type of rater training. This ensures that students are exposed to a science-based model of team-member behavior before they are asked to work with teammates on a group project. Currently, the CATME system can prevent students who do not complete Rater Calibration from being able to complete self or peer evaluations. This serves as a way of documenting that students have been exposed to the rater calibration activity. In the enhanced version of Rater Calibration that is in development, the system will display students' scores for the rater calibration exercises. These scores will serve as a method of demonstrating achievement for learning goals related to understanding a research-based model of teamwork and being able to accurately rate team-member contributions.

The second way that Rater Calibration can facilitate assurance of learning is by increasing the accuracy of students' self and peer evaluation data. Therefore, the data that assessment officers use for assurance of learning should be more reliable than it would be without Rater Calibration. Rater Calibration would reduce rating errors from students not understanding how to use the instrument properly. It would also make students aware that their instructors want them to rate accurately, which could increase motivation to rate accurately.

Data Security and Confidentiality in the CATME System

Because the CATME system collects information from students, it is important to understand how those data are protected and used. The web interface for the system was developed by of Deer Run Associates, a consulting firm that focuses on information security and computer forensic investigations. Data security was a top priority in the system's development.

Instructors who use the system upload students' names, e-mail addresses, and student identification numbers. When an instructor uploads a student e-mail address that is not already in the CATME system, the system assigns a unique identifier that represents that student in the system. When instructors collect data in Team-Maker or CATME Peer Evaluation, they control when and if they will release the results to their students. In Team-Maker, the only results that can be released to students are the teammates' e-mail addresses and schedule availability. This facilitates initial contact and scheduling team meetings. The feedback that can be released with CATME Peer Evaluation was described earlier.

When the data collection periods end, instructors are prompted to make a decision about releasing the results. Their choices are: students and researchers, researchers only, students only, and nobody. Before instructors release the results, they can preview what any particular student would see if they release the results to students. Students' comments are never released

to other students or the research team; they are only viewable by instructors and their designees (other faculty members or teaching assistants). If instructors release the information to researchers, the information goes into a database that shows the CATME system's unique identifiers for the students, but not the students' names, e-mail addresses, or student identification numbers. Therefore, the data in the research database do not identify the students.

Although the system's database does not contain identifying information for students, it does keep a record of the instructors and the names that they choose for each class; the identity-stripped student data are saved within those classes. Instructors retain access to all of the information that they collect from students in their courses unless they choose to delete it.

DISCUSSION

The CATME system provides a unique set of tools that were developed to support teamwork in higher education classes and facilitate better experiences for instructors and students. The CATME tools are web-based and freely available for use in higher education. Moreover, the features of the web-based system allow for the collection and analysis of student data that are directly relevant for the assessment of team skills. Thus, the system could be used to document students' team-skill development for AACSB accreditation reviews. AACSB's new accreditation standards, adopted in April 2013, place additional emphasis on the importance of team skills and interpersonal skills. A large number of specific learning goals can be assessed and evaluated using the CATME system. Examples of potential learning goals and how related outcomes can be operationalized and assessed are provided in Appendix A.

Limitations and Directions for Future Research

Limitations to using the CATME system to document the development of team skills as described in this paper do exist. One is that the system was developed as a tool to support

teamwork in individual classes, and it computes statistics and displays data for those purposes in a way that is easy and not time consuming. Although the system uses a unique identifier for each student based on the e-mail the instructor inputs for the student, the system does not currently track student data across classes. Therefore, it would involve time for assessment officers to collect, analyze, and interpret the data across courses.

Although the system has been voluntarily adopted by more than 3,300 faculty members at nearly 700 institutions, it is not used by all instructors who teach with teamwork at any of these institutions. Colleges that wanted to use the measures described in this paper would need to convince all of the instructors who use teamwork in their courses to adopt the CATME system. This would likely have learning benefits for students in addition to providing data for assessment; however, it would require building a consensus among the faculty at the institution to use the system, which tools to use, and what questions to ask. A limitation of the current paper is that it does not provide empirical data for such implementations. When colleges begin to implement the recommendations in this paper and data become available, they should be analyzed and the findings reported in the literature.

We cited evidence in this paper that using a consistent peer evaluation system repeatedly and providing multiple rounds of feedback have benefits for students, including learning to rate teamwork better, improving team skills, and developing better self-awareness. (Brutus & Donia, 2010; Brutus, Donia, & Ronen, 2013; Lancellotti & Boyd, 2008; Mayo, Kakarika, Pastor, & Brutus, 2012). These studies, however, were conducted with other peer evaluation systems. We also described published studies that provided evidence for the validity of the tools in the CATME system. Future research should examine the learning benefits of using the CATME system and the effects of using the system on team processes and outcomes such as

cohesiveness, conflict, and satisfaction. These variables can be collected in the CATME system, which will facilitate this research. Future research can also examine the effects of various team composition variables using the Team-Maker data.

Although the CATME system has a number of useful features, it cannot solve all problems related to team-skill development or the measurement of team skills. Developing appropriate team tasks that meet the course learning objectives and require students to work interdependently is a key aspect of group learning experiences that only instructors can achieve. Without a task that truly requires collaboration, many teams will divide the tasks and students will perform most of the work independently, reducing the chances that students will develop team skills and interpersonal skills even though the program of study includes group experiences.

The CATME Peer Evaluation system relies on self and peer ratings of team-members' contributions to the team. A number of problems with this type of ratings data are well-known in the literature. Self-ratings of team contributions are vulnerable to leniency errors (Inderrieden, Allen, & Keaveny, 2004). The self-ratings of students with poor team skills are particularly likely to be inflated because people with weak skills are often unable to recognize their own deficiencies (Ehrlinger, Johnson, Banner, Dunning, & Kruger, 2008; Kruger & Dunning, 1999). Students with poor teamwork skills are also less able to accurately appraise their teammates' team skills (Jassawalla, Sashittal, & Malshe, 2009). Some students feel social pressure to give good ratings rather than to rate based on their honest opinions (Mero, Guidice, & Brownlee, 2007). As a result, peer ratings are not always as differentiated as would be warranted based on the rating criteria specified by instructors (Saavedra & Kwun, 1993). Some students express concern that peer ratings will be biased by students' relationships, so that team members could

give friends higher ratings than warranted or assign low ratings based on jealousy or revenge (Taggar & Brown, 2006). All of these are general concerns about any peer evaluation system.

An additional concern is that, although students need to learn to give and receive peer feedback because this is common in the workplace (Druskat & Wolff, 1999; Hooijberg & Lane, 2009), the process makes some students uncomfortable (Pope, 2005). Repeated use of a consistent on-line peer evaluation system, however, can reduce this discomfort (Brutus, Donia, & Ronen, 2013). Receiving negative feedback can also be unpleasant for students, but it can make students aware of skill deficiencies of which they are unconscious, which can create a context for transformative learning to occur (Mayo, Kakarika, Pastor, & Brutus, 2012). Using a consistent system throughout a student's program of study would provide students who received negative feedback with opportunities to improve and to receive positive feedback in the future.

The developers of the CATME system have received funding to develop web-based teamwork training modules (Ohland, et al., 2013). The training modules will be based on the sciences of training (Salas & Cannon-Bowers, 2001). When completed, the training system will include information, demonstration, practice, and feedback. This training technique has a number of advantages (Rosen, Salas, Pavlas, Jensen, Fu, & Lampton, 2010). Providing this training to prepare students to work effectively in teams before they are assigned team projects will help colleges to document their efforts to build students' team skills. These training materials will also facilitate future studies to determine if providing team-skill training builds team skills and enhances students' team experiences. It is likely that students will prefer this to the "sink or swim" approach to teamwork that is common in many colleges (Vik, 2001).

CONCLUSION

AACSB has adopted new accreditation standards that require colleges of business to ensure that students are developing team skills, as well as interpersonal skills, the ability to work in diverse, multicultural environments, and an ability to think reflectively about the relationships between themselves and others. These team skills and related interpersonal competencies are critical business skills that employers demand. Although colleges have generally provided opportunities for teamwork, recruiters perceive that graduates often lack team skills. The implementation of team-based learning methods and assessing whether they are leading to the development of team skills present a host of challenges. Colleges of business need reliable ways to enhance students' team skills and evaluate and document whether their programs are achieving appropriate student outcomes. We show how the CATME system can facilitate these.

The CATME system provides an efficient way for colleges to deliver aspects of teamwork training and keep track of students' team experiences. Instructors can use CATME to manage teamwork in their classes and collect and analyze data about students and teams for student feedback, grading purposes, or to evaluate their teaching methods. We show how colleges that use CATME system in all courses that require teamwork could use the data to demonstrate that their programs develop students' team skills for assurance of learning.

REFERENCES

AACSB International. (2013). Eligibility Procedures and Accreditation Standards for Business

Accreditation (Adopted April 8, 2013). Published by AACSB International, Tampa, FL.

(downloaded 4/12/13 from www.aacsb.edu.)

Alsop, R. (2002). Playing well with others. *The Wall Street Journal*, September 9, 2002, R11.

American Management Association (2010). AMA 2010 Critical Skills Survey. Downloaded on

July 2, 2012 from

http://www.p21.org/storage/documents/Critical%20Skills%20Survey%20Executive%20Sum

mary.pdf

Bacon, D. R. (2003). A comparison of multiple-choice and short-answer questions in a

marketing context. *Journal of Marketing Education*, 25, 31-36.

Bacon, D. R. (2005). The effect of group projects on content-related learning. *Journal of

Management Education*, 29, 248-267.

Bacon, D. R., Stewart, K. A., & Anderson, E. S. (2001). Methods of assigning players to teams:

A review and novel approach. *Simulation & Gaming*, 32, 6-17.

Bacon, D. R., Stewart, K. A., & Silver, W. S. (1999). Lessons from the best and worst student

team experiences: How a teacher can make the difference. *Journal of Management

Education*, 23, 467-488.

Baker, D. F. (2008). Peer assessment in small groups: A comparison of methods. *Journal of

Management Education*, 33, 183-209.

Bamberger, P. A., Erev, I., Kimmel, M., & Oref-Chen, T. (2005). Peer assessment, individual

performance, and contribution to group processes: The impact of rater anonymity. *Group &

Organization Management*, 30, 344-377.

Biemann, T., Cole, M. S., & Voelpel, S. (2012). Within-group agreement: On the use (and misuse) of r_{wg} and $r_{wg(j)}$ in leadership research and some best practice guidelines. *The Leadership Quarterly*, 66-80.

Bliese, P. D. (1998). Group size, ICC values, and group-level correlations: A simulation. *Organizational Research Methods*, 1(4), 355-373.

Bliese, P. D. (2000). Within group agreement, non-independence and reliability: Implications for data and analysis. In K. J. Klein, & S. W. J. Kozlowski (Eds.), *Multilevel theory, research, and methods in organizations: Foundations, extensions, and new directions,* pp. 349-381. San Francisco: Jossey-Bass.

Boni, A. A., Weingart, L. R., & Evenson, S. (2009). Innovation in an academic setting: Designing and leading a business through market-focused, interdisciplinary teams. *Academy of Management Learning & Education*, 8, 407-417.

Brutus, S., & Donia, M. B. (2010). Improving the effectiveness of students in groups with a centralized peer evaluation system. *Academy of Management Learning & Education*, 9, 652-662.

Brutus, S., & Donia, M. B., & Ronen, S. (2013). Can business students learn to evaluate better? Evidence from repeated exposure to a peer evaluation system. *Academy of Management Learning & Education, 12, 18-31.*

Bryant, S. M., & Albring, S. M. (2006). Effective team building: Guidance for accounting educators. *Issues in Accounting Education*, *21*(3), 241-265.

Burdett, J. (2003). Making groups work: University students' perceptions. *International Education Journal*, 4, 177-190.

Calloway School of Business and Accountancy of Wake Forest University (2004). *A Report on*

    Recruiters' Perceptions of Undergraduate Business Schools and Students. February 2004.

Carless, S. A., & de Paola, C. (2000). The Measurement of Cohesion in Work Teams. *Small*

    Group Research, 31, 71-88.

Chapman, K. J., Meuter, M. Toy, D., & Wright, L. (2006). "Can't We Pick Our Own Groups?

    The Influence of Group Selection Method on Group Dynamics and Outcomes." *Journal of*

    Management Education, 30, 557-569.

Chapman, K. J., & van Auken, S. (2001). Creating Positive Group Project Experiences: An

    Examination of the Role of the Instructor on Students' Perceptions of Group Projects.

    Journal of Marketing Education. 23, 117-127.

Chen, G., Donahue, L. M., & Klimoski, R. J. (2004). Training undergraduates to work in

    organizational teams. *Academy of Management Learning and Education*, 3, 27-40.

Cottell, Jr., P. G., & Millis, B. J. (1992). Cooperative learning in accounting. *Journal of*

    Accounting Education, 10, 95-111.

Deeter-Schmelz, D. R., Kennedy, K. N., & Ramsey, R. P. (2002). Enriching our understanding

    of student team effectiveness. *Journal of Marketing Education*, 24, 114-124.

Dillenbourg P. (1999). What do you mean by collaborative learning? In P. Dillenbourg (Ed).

    Collaborative-learning: Cognitive and Computational Approaches. (pp.1-19). Oxford:

    Elsevier.

Dochy, F., Segers, M., & Sluijsmans, D. (1999). The use of self-, peer and co-assessment in

    higher education : A review. *Studies in Higher Education*, 24, 331-350.

Dominick, P. G., Reilly, R. R., & McGourty, J. W. (1997). The effects of peer feedback on team

    member behavior. *Group & Organization Management*, 22, 508-520.

Druskat, V. U., & Wolff, S. B. (1999). Effects and timing of developmental peer appraisals in

    self-managing work groups. *Journal of Applied Psychology*, 84, 58-74.

Ehrlinger, J., Johnson, K., Banner, M. Dunning, D. & Kruger, J. (2008). Why the unskilled are

    unaware: Further explorations of (absent) self-insight among the incompetent.

    Organizational Behavior and Human Decision Processes, 105, 98-121.

Feichtner, S. B., and Davis, E. A. (1984). Why some groups fail: A survey of students'

    experiences with learning groups. *Journal of Management Education*, 9(4), 58-73.

Felder, R. M., & Brent, R. (2001). Effective strategies for cooperative learning. *Journal of

    Cooperation & Collaboration in College Teaching*, 10: 69-75.Fellenz, M. R. 2006. Toward

    fairness in assessing student groupwork: A protocol for peer evaluation of individual

    contributions. *Journal of Management Education*, 30, 570-591.

Fellenz, M. R. (2006). Toward fairness in assessing student groupwork: A protocol for peer

    evaluation of individual contributions. *Journal of Management Education*, 30, 570-591.

Gardiner, L. R., Corbitt, G., & Adams, S. J. (2010). Program assessment: Getting to a practical

    how-to model. *Journal of Education for Business*, *85*(3), 139-144.

Gueldenzoph, L. E., & May, G. L. (2002). Collaborative peer evaluation: Best practices for

    group member assessments*. Business Communication Quarterly*, 65, 9-20.

Hart Research Associates (2006). *How Should Colleges Prepare Students to Succeed in Today's

    Global Economy?* A survey of employers conducted on behalf of the Association of American

    Colleges and Universities. Washington, DC: Peter D. Hart Research Associates.

Hart Research Associates (2010). *Raising the Bar: Employers' Views on College Learning in the

    Wake of the Economic Downturn.* A survey of employers conducted on behalf of the

    Association of American Colleges and Universities. Washington, DC: Hart Research

    Associates.

Heidemeier, H., & Moser, K. (2009). Self–other agreement in job performance ratings: A meta-analytic test of a process model. *Journal of Applied Psychology*, *94*(2), 353.

Hernandez, S. A. (2002). Team learning in a marketing principles course: Cooperative structures that facilitate active learning and higher level thinking. *Journal of Marketing Education*, 24, 73-85.

Hess, P. W. (2007). Enhancing leadership skill development by creating practice/feedback opportunities in the classroom. *Journal of Management Education*, 31, 195-213.

Hooijberg, R. & Lane, N. (2009). Using multisource feedback coaching effectively in executive education. *Academy of Management Learning & Education*, 8, 483-493.

Hughes, R. L., & Jones, S. K. (2011). Developing and assessing college student teamwork skills. *New Directions for Institutional Research*, 2011(149), 53-64.

Inderrieden, E. J., Allen, R. E., & Keaveny, T. J. (2004). Managerial discretion in the use of self-ratings in an appraisal system: The antecedents and consequences. *Journal of Managerial Issues*, 16, 460-482.

Jassawalla, A., Sashittal, H., & Malshe, A. (2009). Students' perceptions of social loafing: It's antecedents and consequences in undergraduate business classroom teams. *Academy of Management Learning & Education*, 8 (1), 42-54.

Jehn, K. A., & Mannix, E. A. (2001). The dynamic nature of conflict: A longitudinal study of intragroup conflict and group performance. *Academy of Management Journal*, 44, 238-251.

Johnson, D. W., Johnson, R. T., & Smith, K. A. (2006). *Active learning: Cooperation in the college classroom* (3rd ed.). Edina, MN: Interaction Book Co.

Kaufman, D.B., Felder, R.M., & H. Fuller, H. (2000). Accounting for Individual Effort in Cooperative Learning Teams. *Journal of Engineering Education,* 8, 133–140.

Kirk, D. J. (2005). *Taking back the classroom: Tips for the college professor on becoming a more effective teacher*. Des Moines, Iowa: Tiberius Publications.

Klein, K. J., & Kozlowski, S. W. J. (2000). *Multilevel theory, research, and methods in organizations: Foundations, extensions, and new directions.* San Francisco: Jossey-Bass.

Kolb, A. Y., & Kolb, D. A. (2005). Learning styles and learning spaces: Enhancing experiential learning in higher education. *Academy of Management Learning and Education*, 4, 193-212.

Kraiger, K. (2008). Transforming our models of learning and development: Web-based instruction as an enabler of third-generation instruction. *Industrial and Organizational Psychology: Perspectives on Science and Practice,* 1, 454-467.

Kruger, J., & Dunning, D. (1999). Unskilled and unaware of it: How difficulties in recognizing one's own incompetence lead to inflated self-assessments. *Journal of Personality and Social Psychology*, 77, 1121-1134.

Lancellotti, M. P., & Boyd, T. (2008). The Effects of Team Personality Awareness Exercises on Team Satisfaction and Performance: The Context of Marketing Course Projects. *Journal of Marketing Education*, 30 (3) 244 254.

Layton, R. A., Loughry, M. L., Ohland, M. W., & Ricco, G. D. (2010). Design and Validation of a Web-Based System for Assigning Members to Teams Using Instructor-Specified Criteria. *Advances in Engineering Education*, 2 (1), 1-28.

Loyd, D. L., Kern, M. C., & Thompson, L. (2005). Classroom research: Bridging the ivory divide. *Academy of Management Learning & Education,* 4, 8-21.

Loughry, M. L., Ohland, M. W., and Moore, D. D. (2007). Development of a theory-based assessment of team member effectiveness. *Educational and Psychological Measurement,* 67,

505-524.

Loughry, M. L., & Tosi, H. L. (2008). Performance implications of peer monitoring. *Organization Science*, 19, 876-890.

MacDonald, H. A., & Sulsky, L. M. (2009). Rating formats and rater training redux: a context-specific approach for enhancing the effectiveness of performance management. *Canadian Journal of Behavioural Science*, *41*, 227-240.

Marks, M. A., Mathieu, J. E., & Zaccaro, S. J. (2001). A temporally based framework and taxonomy of team process. *Academy of Management Review*, 26, 356-376.

Mayo, M., Kakarika, M. Pastor, J.C., & Brutus, S. (2012). Aligning or inflating your Leadership self-image? A longitudinal study of responses to peer feedback in MBA teams. *Academy of Management Learning & Education, 11, 631-652*.

McCorkle, D. E., Reardon, J., Alexander, J. F., Kling, N. D., Harris, R. C., & Iyer, R. V. (1999). Undergraduate marketing students, group projects, and teamwork: The good, the bad, and the ugly? *Journal of Marketing Education*, 21, 106-117.

Mero, N. P., Guidice, R. M., & Brownlee, A. L. (2007). Accountability in a performance appraisal context: The effect of audience and form of accounting on rater response and behavior. *Journal of Management*, 33, 223-252.

Michaelsen, L. K., Knight, A. B., & Fink, L. D. (Eds.). (2004). *Team-based learning: A transformative use of small groups in college teaching.* Sterling, VA: Stylus Publishing.

Millis, B.J., & P.G. Cottell, Jr. 1998. *Cooperative Learning for Higher Education Faculty*. Phoenix, AZ: American Council on Education/Oryx Press.

Moriarty, P., & Buckley, F. (2003). Increasing team emotional intelligence through process. *Journal of European Industrial Training, 27*(2-4), 82-110.

National Association of Colleges and Employers. (2011). Job Outlook: The candidate skills/qualities employers want. Downloaded July 2, 2012 from http://www.naceweb.org/s10262011/candidate_skills_employer_qualities/

Oakley, B., Felder, R. M., Brent, R., & Elhajj, I. (2004). Turning Student Groups into Effective Teams. *Journal of Student Centered Learning*, *2*, 9–34.

Ohland, M. W., Loughry, M. L., Layton, R. A., Lyons, R., Ferguson, D. M., Heyne, K., Driskell, T. Woehr, D. J., Pomeranz, H.R., Salas, E., Loignon, A.C., & Sonesh, S. C. (2013). SMARTER Teamwork: System for Management, Assessment, Research, Training, Education, and Remediation for Teamwork. *Proceedings of the 2013 American Society of Engineering Education Annual Conference & Exposition*, Atlanta, GA.

Ohland, M. W., Loughry, M. L., Woehr, D. J., Finelli, C. J., Bullard, L. G., Felder, R. M., Layton, R. A., Pomeranz, H. R., & Schmucker, D. G. (2012). The comprehensive assessment of team member effectiveness: Development of a behaviorally anchored rating scale for self and peer evaluation. *Academy of Management Learning & Education, 11, 609-630*.

Pfaff, E., & Huddleston, P. (2003). Does it Matter if I Hate Teamwork? What Impacts Student Attitudes toward Teamwork. *Journal of Marketing Education*, 25, 37- 45.

Pope, N. K. L. (2005). The impact of stress in self- and peer assessment. *Assessment & Evaluation in Higher Education*, 30, 51-63.

Raelin, J. (2006). Does action learning promote collaborative leadership? *Academy of Management Learning and Education*, 5, 152-168.

Rosen, M. A., Salas, E., Pavlas, D., Jensen, R., Fu, D., & Lampton, D. (2010). Demonstration-based training: A review of instructional features. *Human Factors*, 52, 596-609.

Saavedra, R. & Kwun, S. K. (1993). Peer evaluation in self-managing work groups. *Journal of Applied Psychology*, 78, 450-462.

Salas, E., Sims, D. E & Burke, C. S. (2005). Is there "big five" in teamwork?. *Small Group Research,* 36, 555-599.

Salas, E., & Cannon-Bowers, J. A. (2001). The science of training: A decade of progress. *Annual Review of Psychology, 52*, 471-499.

Shankar, P. G., & Seow, J. L. (2010). The association between students' lone wolf tendencies and their perceptions, preferences, and performance outcomes in team projects. *Journal of Accounting Education*, 28, 75-84.

Taggar, S., & Brown, T. C. (2006). Interpersonal affect and peer rating bias in teams. *Small Group Research*, 37, 87-111.

The Chronicle of Higher Education Almanac Issue (2009-10). 56 (1), August 28, 2009.

The Wall Street Journal/Harris Interactive Survey (2002). The rating criteria. *The Wall Street Journal*, September 9, 2002, R5.

Thomas, G., Martin, D., & Pleasants, K. (2011). Using self- and peer-assessment to enhance students' future-learning in higher education. *Journal of University Teaching & Learning Practice*, 8(1), article 5.

Vance, E. (2007, February 2). College graduates lack key skills, report says. *Chronicle of Higher Education, 53* (22), A30.

Van der Vegt, G. S., Emans, B. J. M., & Van de Vliert, E. (2001). Patterns of interdependence in work teams: A two-level investigation of the relations with job and team satisfaction. *Personnel Psychology*, 54, 51-69.

Verzat, C., Byrne, J. & Fayolle, A. (2009). Tangling with spaghetti: Pedagogical lessons from

games. *Academy of Management Learning and Education*, 8, 356-369.

Vik, G. N. (2001). Doing more to teach teamwork than telling students to sink or swim. *Business Communication Quarterly, 64* (4), 112-119.

Willcoxson, L. E. (2006). "It's not Fair!": Assessing the Dynamics and Resourcing of Teamwork. *Journal of Management Education*, *30*(6), 798-808.

Young, C. B., & Henquinet, J. A. (2000). A conceptual framework for designing group projects. *Journal of Education for Business*, 76, 56-60.

Zantow, K., Knowlton, D. S., & Sharp, D. C. (2005). More than fun and games: Reconsidering the virtues of strategic management simulations. *Academy of Management Learning and Education,* 4, 451-458.

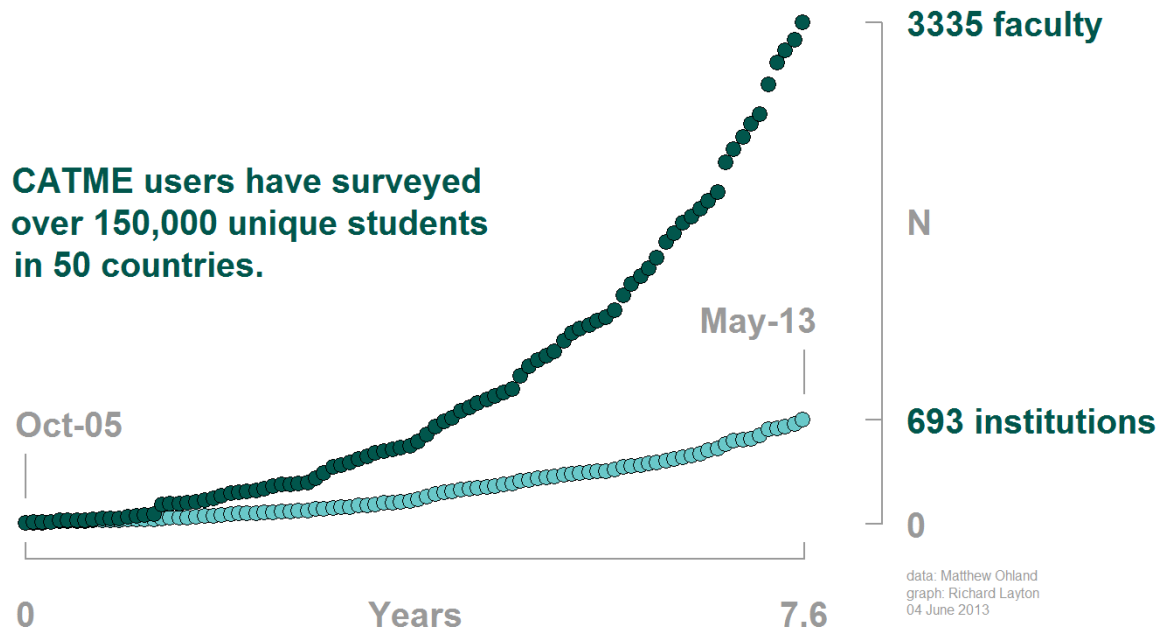**FIGURE 1**

Growth of the CATME System User Base

3335 faculty

CATME users have surveyed
over 150,000 unique students
in 50 countries.

May-13

N

Oct-05

693 institutions

0

0   Years   7.6

data: Matthew Ohland
graph: Richard Layton
04 June 2013

Figure 2

One of the Five Dimensions of the CATME Behaviorally Anchored Rating Scale

Contributing to the Team's Work   `<< Back` `Next >>`

Mary Adams	Gene Christiansen	Sally Jones	Alex Tyler	Description of Rating
○	○	○	◉	• Does more or higher-quality work than expected. • Makes important contributions that improve the team's work. • Helps teammates who are having difficulty completing their work.
○	◉	○	○	Demonstrates behaviors described immediately above and below.
◉	○	○	○	• Completes a fair share of the team's work with acceptable quality. • Keeps commitments and completes assignments on time. • Helps teammates who are having difficulty when it is easy or important.
○	○	○	○	Demonstrates behaviors described immediately above and below.
○	○	◉	○	• Does not do a fair share of the team's work. Delivers sloppy or incomplete work. • Misses deadlines. Is late, unprepared, or absent for team meetings. • Does not assist teammates. Quits if the work becomes difficult.

APPENDIX A

SAMPLE LEARNING GOALS AND

METHODS TO DEMONSTRATE ACHIEVEMENT

Goal	Demonstration of Achievement	Sample Program Target
Students have opportunities to work collaboratively.	Number of team learning opportunities in the student's program of study measured by a count of each student's separate team experiences in the CATME system.	At least 70% of students will have at least 8 team experiences during their undergraduate coursework.
Students actively participate in group learning experiences.	CATME peer evaluations of team-member contributions provide data to verify that each member of the team actively participated in the team's learning experiences.	At least 90% of students will have an average peer evaluation score of 2.5 or better on four or more team activities.
Students will understand the factors necessary to work effectively on teams and recognize effective and ineffective team-member behaviors.	Rater Calibration Scores demonstrate whether students understand the dimensions of teamwork in the CATME model and can accurately rate teamwork behaviors.	At least 90% of students will pass the rater calibration exercise at least one time.
Students will be able to recognize the different ways in which their peers contribute to collaborative work.	Level of agreement of each student's ratings of a given team member in peer ratings on CATME Peer Evaluation.	At least 65% of students will participate on a team that has an r_{wg} of .70 or greater in peer ratings measured in a junior- or senior-level course.
Students will be able to evaluate their own contributions to team work.	Level of agreement between self and peer ratings on CATME Peer Evaluation.	At least 70% of students in a senior level course will have a summed absolute deviation score of less than 5. This is calculated by taking the absolute value of the deviation between the self-rating and the mean peer rating for each dimension, summing them, then looking to see if difference is greater than 5 (an average

		difference of no more than 1 scale point).
Students will gain experience working with people of diverse backgrounds.	The Team-Maker data document each team on which the student was a member, showing diversity, if any, in the team composition in terms of gender, race, age, and discipline.	At least 70% of students will work on at least two teams that include a member of the opposite gender, a different race, or another major.
Students will display good interpersonal skills in teamwork contexts.	Average scores for "Interacting with Others" on CATME Peer Evaluation.	At least 70% of students will have at least two team experiences in which their teammates rated them 3 or higher on "Interacting with Others."
Students will contribute effectively to teams.	Minimum score on the five dimensions of CATME Peer Evaluation.	At least 80% of students will have at least two team experiences in which their minimum peer evaluation score on each of the five dimensions of CATME was at least 3.
Students will demonstrate improvement in team-based skills over time.	Average CATME Peer Evaluation scores across multiple team experiences.	There will be a positive trend in CATME scores across courses for 80% of students whose CATME Peer Evaluation scores initially averaged 3.5 or below.
Students will be able to provide feedback pertaining to peers' team skills.	Level of differentiation across the five CATME dimensions and across team members.	At least 50% of rating variance will be attributed to person and dimension sources across the five CATME dimensions and across team members.
Students will understand and recognize team process outcomes relevant to good team functioning.	Consistent answers on multiple items in CATME peer evaluation follow-up questions assessing team interdependence, satisfaction, cohesion, and conflict.	Team process measures will demonstrate internal consistency reliability (alpha) averaging .6 or above.
Students will reliably recognize team process	Level of agreement on rating of team process outcomes.	At least 65% of students will participate on a team

outcomes.		that has an r_{wg} of .70 or greater in team process outcomes in a junior or senior level course.
Students will learn how to interact effectively on teams.	Level of relationship conflict and cohesion.	At least 70% of students will participate on a team that has average scores on relationship conflict of 2.5 or lower and at least 3.25 on cohesion.