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Trends of Team Management Tool Usage and Teamwork Behavioral Effectiveness Ratings in Community Colleges

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ABSTRACT

BACKGROUND & CONTEXT

Community colleges in the United States – similar to Technical and Further Education (TAFE) institutions in Australia and Vocational Colleges in the EU – are a critical component in higher education. Community college students typically have more commitments than four-year college students outside of their educational pursuits. A lack of time and energy might result in less engagement in collaborative learning opportunities and fewer chances to develop teamwork skills.

PURPOSE OR GOAL

Community college students remain under-researched in teamwork scholarship. It is important to better understand this population for collaborative learning and teamwork skills to generate insights on how to better serve them. This work explores the following research question: “What are the trends of self- and peer-rating patterns for teamwork behavioral effectiveness of community college students?”

APPROACH OR METHODOLOGY

Using archived, de-identified data from the Comprehensive Assessment of Team Member Effectiveness (CATME) platform, we employed a descriptive research design to provide a snapshot of the status quo of student-rated teamwork behavioral effectiveness. Specifically, we calculated and summarized several pertinent metrics, such as the usage count of questions for team formation and statistics of ratings for teamwork assessment.

OUTCOMES

This work provides quantitative trends of team management tool (CATME) usage at community colleges, which provides useful information for best practices for team management tools for other interested instructors to adopt team-based learning pedagogy.

CONCLUSIONS

This work provides foundational measurement evidence of community college student teamwork and related metrics and further recommends teaching practices and additional research directions to better serve this population and improve their teamwork skills.

KEYWORDS

community college, vocational education, teamwork, descriptive statistics.

Introduction

Community colleges, junior colleges, and technical colleges – varieties of two-year colleges – have remained a critical component of the U.S. higher education system for decades (Bailey, 2003; U.S. Department of Education & National Center for Education Statistics, 2000). Richardson and Leslie (1980) describe community colleges as serving a variety of roles that have persisted to the current day, including (1) serving as a means to access four-year programs through transfer, (2) vocational and technical education, (3) developmental programming, (4) continuing education programs, (5) community service within their locality, and (6) placement of students into the workforce. Within engineering education, the role that tends to receive the most attention is its transfer function, as a pathway for students who intend to transfer to a four-year institution to complete their Bachelor's degrees. However, despite these varied roles of community colleges and policymakers' aspirations, not all community college students who aspire to earn a Bachelor's degree successfully transfer to a four-year institution, and even fewer complete their degrees (Bailey, 2003). In a more recent report by the Community College Research Center (CCRC), of students beginning their studies in 2015, only 16 percent of community college students earned a Bachelor's degree within six years (Velasco et al., 2024).

The retention issue is quite layered; we focus on one characteristic of community college students that contrasts with their counterparts at four-year universities. Community college students typically have more commitments outside of their educational pursuits (Royal, 2022). Over half of community college students are employed, compared with only 37% of 4-year college students (Goldrick-Rab, 2010). This lack of time and energy due to external commitments and employment might result in less engagement in typical collaborative learning opportunities that demand availability outside of class and fewer chances to develop teamwork skills as a result. Considering teamwork is consistently placed at the top of the highly desired competency list across disciplines (Alsop, 2002; National Association of Colleges and Employers, 2019), a shortfall in teamwork skill development may hinder the goals of community colleges in providing opportunities for students to obtain the necessary skills and competencies to increase their employability and potential to transfer to four-year colleges.

Although educators widely realize the importance of creating opportunities and spaces for students to practice and improve teamwork competency, studies have shown a knowledge gap in instructional practices of teamwork skills specific to community college instructors. Hora and colleagues (2022) explored community college instructors' perceptions of teaching teamwork skills in computer technology courses and synthesized three factors affecting this knowledge gap: 1) instructors' backgrounds on their teaching practice; 2) instructors' situational cognitions of definition and conceptualization of teamwork skills; and 3) the prominent usage of teacher-centered practices. They concluded that while faculty realized teamwork competency was critical, their teaching practices were not tailored to be student-centered to nurture the development of teamwork skills of students truly (Hora et al., 2022). Uncertainty of evaluation tools and plans on teamwork for community college instructors to adopt cooperative learning in the classroom poses additional barriers (Strom & Strom, 2002), which may demotivate them from adopting team-based teaching.

Given these challenges in teaching teamwork skills in community colleges, there is a clear need for research to provide evidence-based suggestions on cooperative learning practices in the community college contexts. To address the challenges of the evaluation tool usage on teamwork, this work provides information about community college instructors' adoption and usage of cooperative learning in classrooms. This study utilized a popular team management tool suite, Comprehensive Assessment of Team Member Effectiveness (CATME) (Ohland et al., 2012), to examine the trend and usage patterns of team management tools, and to investigate the rating patterns of adopted measurement instruments. CATME has two primary features. Team-Maker utilizes instructor-specified criteria to form teams. Those criteria include, but are not limited to, student-reported gender and race/ethnicity, availability to meet outside the class, and previous GPA (Layton et al., 2010). The other feature is Peer Evaluation, which

centralizes a series of survey instruments related to teamwork and written peer comments administered to students (Ohland et al., 2012). These tools facilitate the adoption of collaborative learning in community colleges and other institutions by serving as a resource for instructors who are uncertain about how to assess students' teamwork effectiveness and how to manage student teams.

Method

Since its launch in 2005, the CATME platform has started collecting data authorized by instructors for research purposes (Layton et al., 2010; Ohland et al., 2012). To date, CATME has served over 2.3 million students and over 27,000 instructors. The data collected by CATME typically includes instructor information (e.g., institution, department); course details (e.g., course name, semester); team formation surveys; peer and self-evaluation responses; and written feedback.

This work defines community college student data as the data collected from any students of instructors at two-year colleges (regardless of whether they are named community colleges). We identified 79 instructors at 26 community colleges who used CATME and released deidentified data for research. All these instructors were from the United States. Twenty of those 79 (25% of) instructors are from engineering departments. Filtering to see only data from community college instructors, we further investigated the specific surveys used, student usage, and rating patterns.

We used a descriptive research design to elicit the general trend of survey usage and student ratings related to teamwork assessment in the CATME data repository in community colleges. We manually examined such patterns for engineering students. Specifically, we used instructor-specific department information, including department names containing "engineering" but not "technology".

Findings

In Figure 1 below, we show the geographic locations of community college institutions with instructors who released data used in the current study. Those instructors are from a variety of disciplines, such as biology, engineering, engineering technology, psychology, chemistry, mathematics, economics, communications, education, political science, and humanities. In the data collected for this study, those 79 instructors engaged 10,194 students and 1,277 different CATME surveys for either team formation or peer evaluation (multiple instruments could be used within each survey). Reporting course-level data seems impractical and less useful because an instructor might use the CATME surveys for repeated measures or across different sections. Considering that instructors usually used CATME surveys as the formative assessment for students' teamwork effectiveness periodically and/or utilized Team Maker for team formation, we found that the ratio of surveys per student was 2.44. This means a community college student CATME user is assigned an average of 2.44 Team-Maker and/or Peer Evaluation surveys. On average, in community colleges, each class session had 8.33 teams and 2.38 students per team.

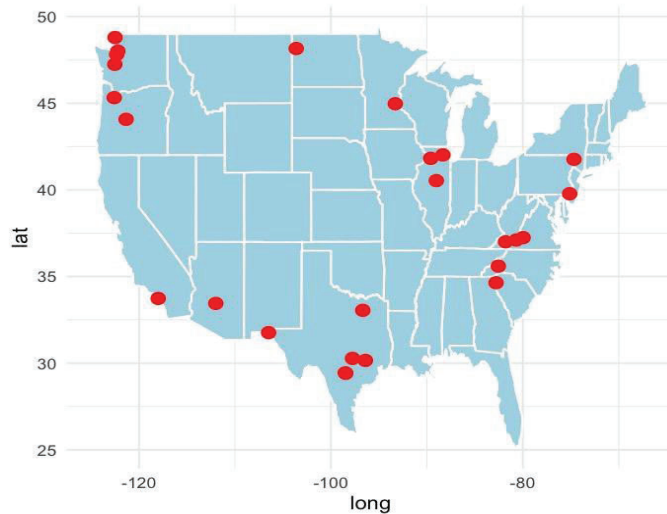


Figure 1: Map of community college instructor users of CATME in the United States

In Figure 2, we provide a chronological bar chart of the usage of CATME by community colleges regarding peer evaluation related to teamwork (PEER EVAL) and team formation (TEAM-MAKER). The usage of PEER EVAL showed a substantial and rapid increase from 2016 to 2019 and has become stable since 2020; we believe it was due to the introduction of license fees for CATME in 2020. The usage of TEAM-MAKER was less popular than PEER EVAL, but showed a similar pattern. Due to the data being captured in April 2024, we could not capture the accurate usage as we would not capture data in active sessions. Therefore, we decided not to show the three times of usage of TEAM-MAKER in 2024 (2024 Winter Session) in Figure 2.

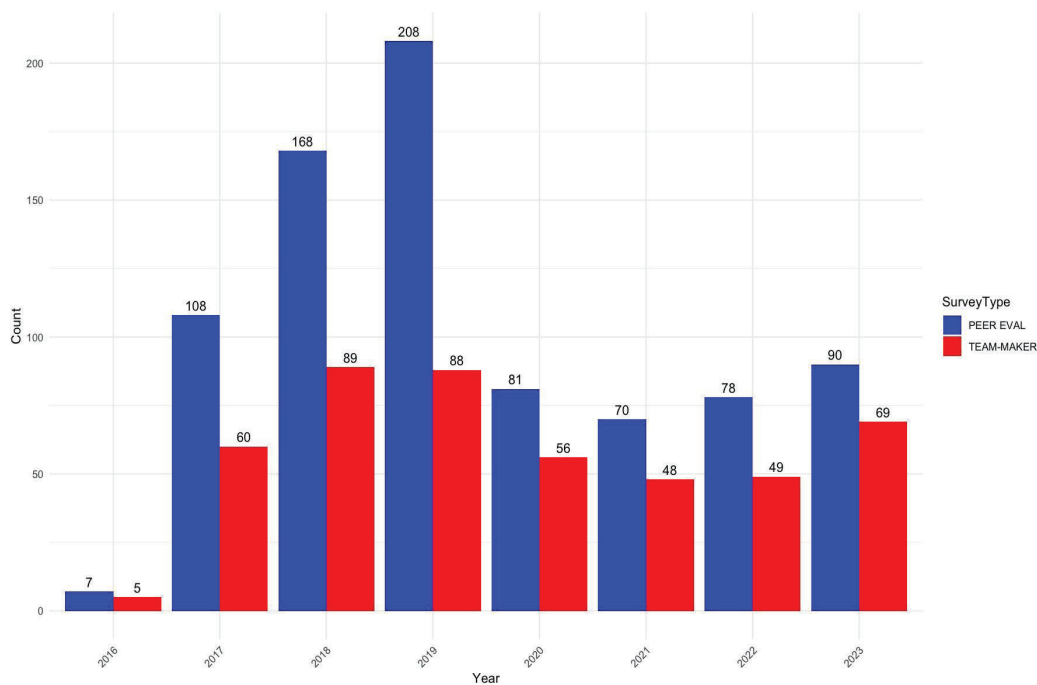


Figure 2: Survey usage by community college instructors in CATME

Next, we list the questions most commonly asked by community college instructors for TEAM-MAKER and CATME, respectively, in Tables 1 and 2. In Table 1, the scheduling

question, answered by 260,000 students, dominates the usage of TEAM-MAKER. We speculate this is because finding common time for students to get together is one of the most essential elements of forming a team as community college students have multiple duties at hand with busy schedules. Other questions answered by over 5,000 students span GPA, gender, leadership roles, language, working style (visionary vs. detail-oriented), writing skills, and majors. Other questions asked by community college instructors include other student demographic information, specific knowledge, skills, and abilities, personal characteristics, previous classes, and other experiences.

Table 1: Questions and the number of usages for TEAM-MAKER by community colleges

Question	Usage count
(Scheduling) Please check the times that you are in class, at work or practice and are busy and unavailable for group work:	261,866
Your overall GPA is:	7466
What is your gender?	6822
What is your preferred leadership role?	5498
Please rate your facility with the English language:	5407
Please select the statement you most closely identify with (visionary vs. details):	5276
Rate your writing skills:	5208
What is your major or primary area of study?	5198
Please indicate the racial/ethnic group with which you most identify:	4981
In this course, you intend to work how many hours per week outside of class (not counting lectures or labs):	4863
Which of the following team leadership structures do you prefer?	4529
How willing are you to participate in team activities on the weekend?	3879
What is your age, in years?	3675
On average, how many hours do you work at an off-campus job each week?	3184
How many credit hours are you attempting this term?	2612
Your ability to use <:FILLMEIN:> is:	2559
On average, how many hours do you work at an on-campus job each week?	2189
Rate your skill with hands-on build or repair tasks:	1629
Your grade in the previous course <:FILLMEIN:> was: [Letter grades automatically converted to numbers (A = 4.0)]	1363
Please indicate one or more areas of disciplinary study:	1291
How long does it take you to get to campus?	1201

Rate your reading skills:	891
How many philosophy books have you read prior to taking this course?	891
Have you purchased the required textbook(s) or materials for this course?	891
What is your class year?	857
How does this class contribute to your goals?	819
Rate your skill with tools or in the machine shop:	773
How many college-level science courses have you taken in the past 4 years (including AP/IB)?	511
Are you currently taking A&P II along with Micro?	375
Where did you spend most of your childhood and teenage years?	375
Have you previously taken a microbiology course (either this course or any other micro course)?	375
Do you currently hold a college degree?	375
In your opinion, which of the following is your strong attribute?	355
If you belong to a sports team this term, select all to which you belong:	291
Are you a veteran?	262
Do you consider yourself an extrovert or an introvert?	261
Did you complete AP Biology or an advanced biology course in high school?	261
How many years since you graduated from high school?	261
Did you complete AP/College Chemistry?	261
Where are you from?	261
How many college credits do you have?	261
Name you prefer to be called.	261
What is your classification?	261
Are you a night owl or a lark (morning person)?	261
What is the grade you are willing to work for?	261
Rate your laboratory skills such as the use of microscope, carry out organic molecule tests or experiments	261
If you are working (FT or PT) this semester, how many hours are you working each week?	261
What grade did you earn in Biology 1406? (4=A, 3=B, 2=C, 1=D, 0=F)	222

What grade did you earn in A&PI ? (4=A, 3=B, 2=C, 1=D, 0=F)	222
What age range do you best fit?	190
When do you prefer to put the most effort towards completion of a project?	190
Please rate your general level of extraversion. Extraverts typically enjoy being the center of attention; starting conversations; and meeting new people	190
What grade are you shooting for in this course?	190
What group best describes your GPA	190
When working on a project, I prefer to	190
How would you rate your organizational skills	190
Did you complete AP/College Calculus?	181
On a scale from 1-10, where 10 is you LOVE biology and 1 is your HATE biology... which number would represent your feelings toward biology?	173
Rate your skills in logical reasoning and mathematics:	171
How would you rate your organizational skills	171
What chemistry courses have you completed? Check all that apply.	125
What is your \Main Assignments Total\ percentage in this class (see gradebook in Blackboard)?	125
What is your \Writing Workshop Total\ percentage in this class (see gradebook in Blackboard)?	125
Please select the option that best describes your area of disciplinary study	105
Have you taken calculus?	103
What grade do you expect to earn in this course?	103
Rate how difficult you view math as a subject:	103
Did you complete AP Biology or an advanced biology course in high school?	103
What state do you consider home?	103
Please select the fraternity/sorority to which you belong (or choose 'None'):	100

Note: Due to space limitations, only questions used 100 or more times are included.

In Table 2, instructors used a variety of instruments to examine student team dynamics and effectiveness. The CATME behaviorally anchored rating scale is the default measurement instrument, which operationalizes five ways a student could demonstrate teamwork effectiveness, including (1) CATME C: Contributing to the Team's Work, (2) CATME I: Interacting with Teammates, (3) CATME K: Keeping the team on Track, (4) CATME E: Expecting Quality, and (5) CATME H: Having Relevant Knowledge, Skills, and Abilities. The system can also collect data about team processes and outcomes using other published instruments; community college instructors also measured conflict (Jehn & Mannix, 2001),

liking (Ohland, et al., 2012), and cohesiveness (Loughry & Tosi, 2008; Carless & de Paola, 2000)) quite often – over 50,000 times. Other popular measures include team satisfaction (Van der Vegt, et al., 2001), peer influences (Loughry & Tosi, 2008), and psychological safety (Edmonson, 1999). Community college students perceive a low level of conflict in each subdimension (process, relationship, and task conflict; a lower score indicates less conflict). Team conflict scores from community college students are similar to the mean score across all student types (1.44 in Spring 2019 semester and 1.28 in Spring 2020 semester) reported previously from a first-year engineering program at a Midwestern institution granting Bachelor's degrees (Wei et al., 2024). Meanwhile, the average rating of each CATME dimensions is higher than 4 out of 5 points, reflecting relatively high perceived teamwork effectiveness performance.

Table 2: Questions, the number of usages, and statistics of ratings for peer evaluation by community colleges

Question	Usage count	Format	mean	SD	median	min	max	skew	kurtosis	S.E.
Team Conflict	62802	1-5	1.38	0.69	1	1	5	2.03	7.56	0.00
Process Conflict			1.33	0.65	1	1	5	2.33	0.39	0.00
Relationship Conflict			1.22	0.59	1	1	5	3.23	14.95	0.00
Task Conflict			1.59	0.76	1	1	5	1.25	4.42	0.01
Contributing to the Team's Work (CATME C)	59886	1-5	4.03	1.06	4	1	5	-1.12	3.79	0.00
Interacting with Teammates (CATME I)	59619	1-5	4.14	0.98	4	1	5	-1.20	4.21	0.00
Keeping the Team on Track (CATME K)	56847	1-5	4.00	1.05	4	1	5	-1.08	3.72	0.00
Expecting Quality (CATME E)	56763	1-5	4.10	0.99	4	1	5	-1.12	3.98	0.00
Follow-Up Questions (liking)	55854	1-5	4.06	1.01	4	1	5	-1.06	3.72	0.00
Team Cohesiveness	54810	1-5	4.16	0.86	4	1	5	-1.16	4.66	0.00
Interpersonal Cohesiveness			4.24	0.75	4	1	5	-0.89	4.08	0.01
Task Attraction			4.15	0.78	4	1	5	-0.80	3.86	0.01
Task Commitment			4.11	1.03	4	1	5	-1.30	4.26	0.01
Having Related Knowledge, Skills, and Abilities (CATME H)	54004	1-5	4.14	0.99	4	1	5	-1.24	4.30	0.00
Team Satisfaction	31038	1-5	4.29	0.92	5	1	5	-1.48	5.08	0.01
Peer Influences	24395	1-5	2.23	1.39	2	1	5	0.57	1.98	0.01
Avoid Overachievers			1.33	0.76	1	1	5	2.62	10.06	0.02
Avoid Underperformers			1.37	0.84	1	1	5	2.55	9.41	0.02
Correct			3.28	1.18	3	1	5	-0.28	2.39	0.03

				Discuss	2.73	1.30	3	1	5	0.20	2.02	0.02
				Gossip	1.41	0.84	1	1	5	2.29	8.16	0.01
				Notice	3.38	1.17	3	1	5	-0.44	2.53	0.02
				Praise	3.69	1.19	4	1	5	-0.69	2.68	0.03
				Report	1.69	1.06	1	1	5	1.48	4.45	0.02
				Urge	2.81	1.26	3	1	5	0.09	2.03	0.02
Psychological Safety	21112	1-7	6.05	1.33	6	1	7	-1.94	6.79	0.01		
Team Interdependence	6885	1-5	3.54	1.09	4	1	5	-0.52	2.57	0.01		
Team Action Processes	1820	1-5	3.76	0.93	4	1	5	-0.48	2.97	0.02		
				Coordination	3.98	0.84	4	1	5	-0.42	2.58	0.04
				Monitoring progress towards goals	3.58	0.98	4	1	5	-0.45	2.91	0.05
				Resource and system monitoring	3.85	0.87	4	1	5	-0.39	2.67	0.04
				Team monitoring and backup	3.63	0.97	4	1	5	-0.46	3.05	0.05
Team Transition Processes	1365	1-5	3.79	0.90	4	1	5	-0.50	3.06	0.02		
				Goal specification	3.71	0.94	4	1	5	-0.51	3.03	0.04
				Mission analysis	4.09	0.74	4	2	5	-0.38	2.61	0.03
				Strategy Formulation and planning	3.57	0.94	4	1	5	-0.31	2.87	0.04
Personal Cultural Orientation	928	1-7	4.41	1.92	5	1	7	-0.32	2.00	0.06		
				Ambiguity intolerance	5.03	1.52	5	2	7	-0.46	2.25	0.14
				Gender Equality	6.23	1.10	7	4	7	-1.18	2.91	0.10
				Independence	4.84	1.34	5	1	7	-0.33	2.85	0.12
				Interdependence	5.70	1.47	6	1	7	-1.40	4.42	0.14
				Masculinity	3.61	1.76	4	1	7	-0.20	2.05	0.16
				Power	3.59	1.42	4	1	6	-0.18	2.01	0.13
				Risk Aversion	3.95	1.63	4	1	7	-0.08	2.07	0.15
				Social Inequality	2.32	1.70	2	1	7	1.28	3.72	0.16
Team Trust	760	1-5	3.66	1.09	4	1	5	-0.70	2.88	0.04		
Cultural Mindset	432	1-6	3.28	1.75	3	1	6	0.13	1.67	0.08		

Conclusion and Discussion

This work set forth to showcase the trends of community college instructors using a specific team management tool, CATME, for its team formation tool, TEAM-MAKER, and peer evaluation tool. We provide detailed statistics for peer evaluation ratings to provide a baseline for interested instructors and researchers to compare with their own sample. We hope this work will facilitate wider adoption of collaborative learning by two-year college instructors to help students develop teamwork skills. Specifically, we notice that the use of a scheduling question is adopted overwhelmingly by community college instructors who used CATME in the past, implying that this feature has great potential to reduce the logistical barriers an instructor might face, allowing students to engage in cooperative learning. Meanwhile, the list of instruments to measure team processes and outcomes is available for other community college instructors to consider using in their classes, and a benchmark score for comparison.

Some limitations are also present in this work. The data sample size of the community college in CATME is relatively small, compared to its popular adoption at larger, 4-year institutions. The limited sample size jeopardizes the reliability of this work, which limits the generalizability of this work to the broader, diverse two-year college population. With this limitation in mind, we avoided any causal inferential analysis, but rather provided descriptive statistics to show the trends of CATME usage in community colleges.

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