Peer Feedback on Teamwork Behaviors: Reactions and Intentions to Change

Ms. Julia Smith, University of Calgary

Julia is a M.Sc. candidate in Industrial/Organizational Psychology at the University of Calgary, supervised by Dr. Thomas O’Neill. Her research interests include the study of factors impacting teamwork and leadership capabilities.

Ms. Genevieve Hoffart, University of Calgary

Genevieve is a first year M.Sc. student under the supervision of Dr. Thomas O’Neill at the University of Calgary focusing on at team dynamics, training, and communication. She has been working with the Schulich School of Engineering for the past four years during which time her focus has been on improving team dynamics and maximizing the student experience. In addition co-developing a communication training framework that has now been applied to over 3500 students campus wide, Genevieve has personally facilitated many of the training sessions. Her goal is to continue working on developing applicable and universal tools to improve the experience and functioning of student teams in institutions across North America.

Dr. Tom O’Neill, University of Calgary

O’Neill is a Professor of Industrial/Organizational Psychology and a leading expert in the areas of team dynamics, virtual teams, conflict management, personality, and assessment. He is director of the Individual and Team Performance Lab and the Virtual Team Performance, Innovation, and Collaboration Lab at the University of Calgary, which was built through a $500K Canada Foundation for Innovation Infrastructure Grant. He also holds operating grants of over $300K to conduct leading-edge research on virtual team effectiveness. Over the past 10 years, Tom has worked with organizations in numerous industries, including oil and gas, healthcare, technology, and venture capitals. He is currently engaged with the Schulich School of Engineering at the University of Calgary to train, develop, and cultivate soft-skill teamwork competencies in order to equip graduates with strong interpersonal and communication capabilities.
Peer Feedback on Teamwork Behaviors: Reactions and Intentions to Change

Introduction

The ability to work well in a team has been identified by the Accreditation Board for Engineering and Technology (ABET) as one of the required graduate outcomes that engineering programs must address to meet accreditation standards. A career in industry will inevitably involve team membership, as companies utilize teamwork to ensure quality control and process smoothness. Given this need, engineering programs must encourage the development of the interpersonal skills necessary for teamwork in their curricula in order to prepare students for success in the workforce. This paper discusses the importance of using peer feedback as a medium for fostering interpersonal skill development and on the importance of using the right tool for collecting peer feedback. Additionally, we explore students’ ratings of accuracy and usability of a specific peer feedback tool, created by ITP Metrics, and their intentions to change based on the feedback they receive.

Background

The utility of using peer feedback to improve target behaviors has been well established in past research. The underlying premise of peer feedback postulates that an introduction to the interpersonal competencies required to be an effective team member, combined with providing feedback on team members’ competencies and receiving feedback on one’s own competencies, will help participants develop and improve their teamwork skills.

One benefit of using peer feedback is that students working together in a team interact more with one another than they would with an instructor, especially in large classes as is frequently the case in engineering undergraduate programs. This means that classmates are able to provide insight that may not otherwise be accurately captured. Additionally, gathering performance feedback from multiple team members rather than solely from an instructor reduces the possibility of bias and increases response reliability. By exposing students to the required team competencies early on in their education, they will gain familiarity with the meaning of those skills and have the opportunity to continue to gather information on their progress throughout their undergraduate education. Furthermore, repeated use of a peer feedback assessment has previously been shown to improve students’ faith in their ability to accurately provide feedback for their peers. Increased confidence in providing feedback could also lead to increased confidence in the accuracy of the feedback one is given.

Given the potential benefit to students in using peer feedback, the next course of action is to implement a tool that can be used to gather comments and ratings from peers. The ideal tool must be user-friendly, psychometrically strong, and well received by students, instructors, and researchers alike. These attributes are essential in order to encourage participation and promote accuracy of the feedback provided. ITP Metrics, the platform used in this study, has been identified as meeting all of the above attributes. ITP Metrics is accessible via an Internet connection on desktop and mobile devices and is free of charge, with an interface that is easy to use for instructors and students. It offers a number of assessments, including the peer feedback
assessment discussed here. This assessment asks students to rate one another and themselves on a number of attributes, which load onto the following factors: communicating with team members; strong foundation of knowledge, skills and abilities; commitment to the team’s work; emphasizing high standards; and keeping the team on track. These dimensions were included in the assessment as they have been validated as critical components for effective team performance and have been established as having strong validity and reliability in past research with an engineering student sample by Ohland et al., who introduced the Comprehensive Assessment of Team Member Effectiveness (CATME)\(^6\). The tool created by ITP Metrics uses slightly different labels than does CATME, which we believe still capture the dimensions well. The anchors used by this system are also slightly different, in that we ask ‘Please rate the extent to which this person engages in this behavior’ rather than providing users with a description of behaviors warranting a low, moderate and high score and asking users to then rate their teammates according to which category they fall under. This change was made in order to enhance usability of the system and will be discussed in greater depth later in the paper. Therefore, the specific items used by this platform are also slightly altered than those used by CATME (see Appendix A); these changes were also made to make the system more user-friendly. Taken together, we believe these changes do not pose a threat to the strong psychometric properties held by the CATME system.

The primary difference between ITP Metrics and the CATME system lies in the diverging interfaces used. In the CATME system, participants rate each team member on all five dimensions one at a time, such that they rate Person X on all five dimensions, then Person Y, etc. The interface used by our tool is designed to make use of social comparison theory, which proposes individuals will default to social contrasting when rating ambiguous concepts in the absence of objective measures\(^7\). Thus, we are able to provide more accurate ratings of both others and ourselves when we are comparing multiple people on the same dimension at the same time\(^7\). Our system makes use of comparative, or relative, ratings, in which students rate the target individual in reference to other individuals\(^8\). Specifically, participants rate both themselves and others across each dimension in sequence, rather than providing ratings across all dimensions for one person at a time as is done in CATME. This approach has been linked to high reliability, validity, and accuracy\(^7,8\), which should theoretically encourage participation, response accuracy, and effectiveness of the tool in educational settings.

Furthermore, this relative comparisons methodology also differs from the absolute measures used in the CATME system\(^6\), which involve rating the individual on target behaviors without referencing others. When making absolute judgments, participants are asked to rate the individual on target behaviors using a Likert-type scale as a referent, with verbal anchors for each number\(^8\). While comparative ratings are currently used less frequently, past meta-analyses\(^11,12,13\) and empirical studies\(^14,15\) have found that the comparative rating method demonstrates stronger criterion-rated validity than does the absolute rating method, meaning that there is a stronger correlation between comparative ratings and criterion measures (such as cognitive ability measures and managerial performance evaluations) than between absolute ratings and criterion measures. Our measures capitalize on this relative comparison model with a unique “slider rating” model, as opposed to a Likert response model, that is described in further detail in the materials section. Our data analyses regarding enhanced psychometric properties
with the interface are in progress, due to the relative newness of the tool. Please see Appendix B for a truncated excerpt of the assessment using the interface.

As the overarching goal of using peer feedback assessments is to guide students on the path to skill development, it is critical to assess whether or not they intend to change their behaviors based on the feedback with which they have been provided. The theory of planned behavior\textsuperscript{16} postulates that behavioral intentions are the most proximal construct to behavioral change, as they represent one’s attitude towards that behavior. This then captures the effort they are willing to expend in order to engage in that behavior and their motivation to engage in that behavior and improve upon it. However, the role of intentions in future behavior is qualified by individuals’ volitional control over the behavior in question, which is the control the individual has over their ability to engage in that behavior\textsuperscript{16}. Volitional control can be impacted by availability of occasions to engage in that behavior, time, and support from others\textsuperscript{16}. As the behaviors captured in this study (communicating with one’s teammates, keeping the team on track) do not require extensive resources and students are encouraged to develop these behaviors through participation in teamwork activities throughout their undergraduate degree, it can reasonably be assumed that they exert volitional control over the focal behaviors. As students can be classified as exercising control over their teamwork competencies, there is a theoretical link between their intentions to change and subsequent future behavior. Furthermore, it has previously been established that if an intention to change is expressed, a corresponding behavioral modification can reasonably be anticipated\textsuperscript{17, 18}. Therefore, our platform aims to encourage students to set intentions to change.

In order to most effectively accomplish this goal, it is also critical to assess students’ reactions to the tool: perceived usefulness and satisfaction have previously been positively linked to behavioral intentions regarding further use of the system\textsuperscript{19}. We are therefore also interested in students’ perceptions of the usability of the tool and the usefulness of providing and receiving peer feedback. The usability of the tool refers to student perceptions of how easily they could navigate the interface and their understanding of the tool. The usefulness of providing and receiving peer feedback refers to student beliefs about the accuracy of the feedback they received and how confident they felt in providing feedback to their peers.

Taken together, the present research explores student reactions to this tool and their intentions to alter their behavior after being presented with the feedback generated from the assessment.

**Method**

**Participants**

Participants in this study were students enrolled in an electrical engineering course at a large Canadian university, $N = 159$. Students worked with group members over the course of the semester on a number of projects, thereby building an interpersonal connection to the members of their team prior to providing the ratings.
Materials and Procedure

Students completed a peer feedback assessment via the ITP Metrics platform, in which they were asked to rate their fellow team members on the five aforementioned competencies and to indicate their reactions to participating in the assessment and on using the tool. The assessment was administered midway through the semester, at which point students had been working with their team for approximately two months and therefore would have knowledge of the teamwork capabilities of their group members. Students were assured that their responses would remain anonymous.

The approach used by ITP Metrics involves the distribution of 10*(k-1) points across one’s team members (k = number of team members; teams consisted of three or four members, meaning the distribution was out of 20 or 30 points) for each of the five teamwork competencies. Participants used a slider to allocate points given for each team member; a slider was also provided for participants’ self-ratings, which is separate from the number of points available for rating team members. On the feedback report, participants were provided with their self-rating, their peer rating (the median of the scores with which their teammates provided them) and the group median for that behavior. Therefore, they were able to identify areas where there is a gap between their self-ratings and their peer ratings and are provided with a benchmark of where they stand in their group via the group median. Knowledge of discrepancies between self and other ratings and their standing compared to their group members could help students target those development areas.

Students were then asked to respond to a series of 25 items about the tool itself. Items were scored on a 5-point Likert-type scale, where 1 = Unsatisfactory, 2 = Bare Minimum, 3 = Moderate, 4 = Strong, and 5 = Outstanding, with high scores indicating a high degree of agreement with the item. This section contained items rating the usability of the tool (9-item scale, α = .87; sample item: “This tool was easy to use”), the accuracy and utility of their teammates’ feedback and confidence in their ability to provide accurate feedback for their teammates (11-item scale, α = .83; sample item: “My team members will provide reliable feedback regarding my performance in the team”), and their intentions to change their teamwork behaviors based on this feedback (5-item scale, α = .89; sample item: “I plan to improve based on the feedback I receive from my peers”). This second section of the assessment is the focus of the present research, as we are interested in exploring student reactions to the tool and their intentions to change based on exposure to their peer assessments.

Each team member was required to participate in the assessment to ensure that all group members received the same number of ratings and to ensure rater anonymity. Once all members had participated, students were able to access their peer feedback report on their dashboard. This report indicated the average proficiency level for each team competency and potential improvement behaviors that were customized to the proficiency level and to the behaviour. A sample behavioral suggestion for a person who received a 10 (a moderate score) on the ‘Keeping the team on track’ competency is “Become more involved in the planning and organizing of work, and provide the team with feedback and support”. See Appendix C for a sample report.
The instructor of the course (a doctoral engineering student) then conducted a brief in-person debrief session. Students were encouraged to discuss areas of the report that they felt were accurate and areas of the report that they were surprised by. Students were then encouraged to discuss their reports with their groups - they were told that it was not necessary to indicate the specific proficiency level they received, but rather to focus on brainstorming ways to improve. The instructor helped guide their brainstorming by providing suggestions for specific behavioural improvements. For instance, if students were unsure on how to improve their ability to keep the team on track, one suggestion was to institute an agenda for their meetings and to hold all members accountable for sticking to that agenda. Students were also told to ensure that their strategies for improvement were specific and actionable, meaning that it was emphasized that the strategies must be clear behavioral actions students could reasonably take and be able to track their progress on these actions.

Results

Following data collection, the descriptive statistics of the data (mean, standard deviation, and internal consistency) were calculated. Students responded positively to the use of this tool, indicating strong satisfaction with its usability, $M = 4.03$, $SD = .70$, $\alpha = .87$, and a moderate-to-strong degree of confidence in the feedback’s accuracy, $M = 3.67$, $SD = .61$, $\alpha = .83$. Students also indicated that they intended to change their behavior based on the feedback received, $M = 3.83$, $SD = .77$, $\alpha = .89$. Furthermore, the spread of the responses was largely clustered toward the high end of the scales for each dimension, indicating high satisfaction and strong expressed intentions to change, as seen in Figures 1, 2, & 3 below. Additionally, there is a strong positive correlation between students’ intentions to change and their beliefs in the accuracy of the feedback, $r = .80$, $p < .001$, as seen in Figure 4 below.

![Figure 1. Students’ average score with their perceptions of the tool’s usability, where the y-axis indicates the frequency of that score in the sample.](image-url)
Figure 2. Students’ average score with regards to their beliefs in the accuracy of the feedback they received and provided, where the y-axis indicates the frequency of that score in the sample.

Figure 3. Students’ average score with regards to their intentions to change based on the feedback they received, where the y-axis indicates the frequency of that score in the sample.
Discussion

Based on the reported findings, we conclude that students are open to receiving peer feedback and generally believe the accuracy of the feedback received to be moderate to strong. Additionally, students are interested in improving their teamwork skills based on their feedback, which highlights the value of including peer feedback assessments in educational team settings to build these professional skills. The strong positive relationship between students' intentions to change and beliefs in the accuracy of the feedback (see Figure 4, above) indicates those students who are expressing a strong intention to change are also indicating higher faith on the accuracy of the feedback; a future study could explore how intentions to change are impacted by increased uses of peer feedback systems.

Behavioral intentions have been connected to future behavior, with a recent meta-analysis on the topic finding the predictive link between behavioral intentions and future behavior especially strong when the behaviors in question are socially desirable, easy to improve, and in student samples. Given the relational nature of teamwork competencies and individuals’ need for affiliation and acceptance by their peers, these behaviors can be classified as socially desirable. Additionally, the provision of customized feedback and a debrief session helps position these behaviors as easy for students to improve upon as they are able to refer to that feedback at their leisure and seek clarification from the researchers affiliated with the assessment, who walk students through the debrief process and assist with brainstorming strategies on how to improve their behaviors. Furthermore, the theory of planned behavior posits that the stronger the intention, the stronger the likelihood is of that person performing that
behavior\textsuperscript{16}. In other words, the strong intentions expressed in that study may indeed be linked to later improvements in teamwork competencies. Therefore, it can reasonably be expected that students will take their feedback into consideration to improve their teamwork competencies in future team encounters.

**Limitations and future directions**

One limitation of the study is seen in students’ responses regarding their beliefs in the accuracy of the feedback. While the majority of students stated that they had at least a moderate belief in the accuracy of their feedback, the mean was lower than for the other two dimensions. One potential explanation for this could be the presence of conflict in the team, resulting in distrust in team members’ abilities to accurately rate their behaviors\textsuperscript{22}. Additionally, this may point to student wariness due to unfamiliarity with the system- past research\textsuperscript{4} has indicated that students show increased confidence in providing ratings with increased uses of a peer feedback system, and this increased feedback could be reflected in increased belief in the accuracy of teammates’ ratings. To explore this further, a follow-up study could examine how belief in the accuracy of the feedback changes with increased usages of the system while accounting for various team dynamic variables such as conflict and trust within the team.

Given the capability of ITP Metrics to track users over time through their university login, future studies could examine how users’ ratings of feedback accuracy change across various team-based courses in their undergraduate degree. Along these lines, a necessary future direction for this stream of research is to follow up on students with repeated administrations of the peer feedback assessment to examine if: 1) they follow through on their intentions to change, and 2) if their responses to the tool change and improve over time. This platform feature could also be useful for institutions seeking to ensure and empirically show that their programs meet accreditation standards.

**Conclusion**

Given the utility of using peer feedback and its potential for helping equip students with the interpersonal skills they need for success, peer feedback assessments are a vital implementation in undergraduate engineering curricula. To best engender behavioral change and skill development, it is also vital to select the appropriate tool for administering peer assessments, namely one that is received positively by students, instructors and researchers, and that encourages students to set intentions for skill development. One such tool is the one created by ITP Metrics and discussed in this study. It has been used for over 12,741 assessments to date, a number that is expected to exponentially increase by the time of the conference. Its ease of use for both instructors and students and the positive response it has received from students identify it as an activity that can easily be integrated into engineering curricula in order to help achieve the teamwork attribute included in the ABET accreditation standards.

Taken together, this research provides empirical support for the positive reception of a peer feedback tool for encouraging soft skill development and suggests that its use in engineering undergraduate classrooms should be expanded in order to capitalize on its utility.
References


Appendix A
Peer Feedback Items

Commitment to the team’s work: Please rate the extent to which each team member engages in the following set of behaviors.
Takes on a fair share of the team’s work.
Demonstrates commitment to the team’s work.
Prepared for team meetings.
Keeps deadlines and delivering complete, accurate work.

Strong foundation of knowledge, skills and abilities: Please rate the extent to which each team member engages in the following set of behaviors.
Acquires new skills or knowledge to improve the team’s performance.
Learns about other teammates’ tasks and roles.
Has sufficient knowledge, skills, and abilities to excel in the team’s activities.

Communicating with team members: Please rate the extent to which each team member engages in the following set of behaviors.
Communicates clearly and shares information.
Exchanges information with teammates in a timely manner.
Asks teammates for feedback and uses their suggestions.
Seeks appropriate team input before taking action.

Emphasizing high standards: Please rate the extent to which each team member engages in the following set of behaviors.
Encourages and motivates the team.
Expresses a belief that the team can do excellent work.
Believes that the team will achieve high standards.
Cares about the quality of team's work.

Keeping the team on track: Please rate the extent to which each team member engages in the following set of behaviors.
Monitors conditions affecting the team and notices problems.
Giving teammates specific, timely, and constructive feedback.
Helps the team plan and organize work, and anticipates issues.

Usability of the tool
The tool was easy to use.
The tool was easy to understand.
The tool ran smoothly.
The tool was aesthetically appealing.
Logging into the system was simple.
The instructions were clear and easy to understand.
It was easy to understand the format of the tool.
The rating categories provided a good description of my peers’ performance.
The survey was easy to complete.
Perceptions about the accuracy of feedback
Team members can provide accurate ratings.
It is appropriate to ask team members to provide ratings.
Team members are willing to be honest in their ratings.
My team members will provide reliable feedback regarding my performance in the team.
My team members will convey a good understanding of my strengths and weaknesses.
I didn't feel comfortable rating my team members.
The feedback will be accurate.
The feedback will be useful.
The feedback will be easy to understand.
The peer feedback will be useful to me.
I think it is valuable to provide team members with feedback.

Intentions to change
The feedback will lead to action steps.
The peer feedback will improve the team's performance.
I plan to improve based on the feedback I receive from my peers.
I will take the feedback from my peers seriously.
I intend to focus on improving certain teamwork behaviors in light of my peer feedback.
Appendix B
Peer Feedback Assessment Sample

Please evaluate each member of your group (including yourself) according to the description. You will have to distribute ALL of the available points across your team members. You may move the sliders to assign points.

**Contributing to the team's work:** Please rate the extent to which each team member engages in the following set of behaviours.

- Takes on a fair share of the team’s work.
- Demonstrates commitment to the team’s work.
- Prepared for team meetings.
- Keeps deadlines and delivering complete, accurate work.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Peer B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peer C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peer D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Points left to redistribute</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

**Self-evaluation**

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Self</td>
</tr>
</tbody>
</table>
### Peer Feedback – Self Rated, Peer Rated, and Group Median

View Report as HTML

This report summarizes your teammates’ rankings of your teamwork competencies. If you are not satisfied with the rankings you can use this feedback to identify strategies for increasing your effectiveness as a team member. The "potential improvement behaviors” provide specific behavioral examples of how to build each of the five team competencies.

<table>
<thead>
<tr>
<th>Team Competency</th>
<th>Contributing to the team’s work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proficiency</td>
<td></td>
</tr>
<tr>
<td>Self Score:</td>
<td>10</td>
</tr>
<tr>
<td>Peer Rated:</td>
<td>10</td>
</tr>
<tr>
<td>Group Median:</td>
<td>10</td>
</tr>
<tr>
<td>Potential Improvement Behaviors</td>
<td>Increase your share of the team’s workload.</td>
</tr>
<tr>
<td></td>
<td>Take on and complete even more responsibilities.</td>
</tr>
<tr>
<td></td>
<td>Prepare even more for team meetings.</td>
</tr>
<tr>
<td></td>
<td>Improve the accuracy of your work, and complete it even more quickly.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Team Competency</th>
<th>Communicating with teammates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proficiency</td>
<td></td>
</tr>
<tr>
<td>Self Score:</td>
<td>10</td>
</tr>
<tr>
<td>Peer Rated:</td>
<td>10</td>
</tr>
<tr>
<td>Group Median:</td>
<td>10</td>
</tr>
<tr>
<td>Potential Improvement Behaviors</td>
<td>Facilitate effective communication in the team.</td>
</tr>
<tr>
<td></td>
<td>Exchange information with teammates more quickly.</td>
</tr>
<tr>
<td></td>
<td>Listen even more to what teammates have to say about issues.</td>
</tr>
<tr>
<td></td>
<td>Always get team input on important matters before going ahead.</td>
</tr>
</tbody>
</table>