

# Assessing the Process of Team-Based Projects to Promote Quality Contribution and Equitable Assessment

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This article explores the development and implementation of a multifaceted evaluation approach aimed at assessing both the product and process aspects of team-based projects. Specifically, it delves into the practice of utilizing peer evaluation to evaluate the intricate process dynamics within team-based projects. In support of this methodology, this article references relevant literature and theories to underscore the importance of assessing the process and advocating for equitable assessment practices. The article includes the peer evaluation form, an informative FAQ page, a group discussion assignment, and a hypothetical example illustrating the grading process.

## Need and Development

Several courses I teach in the **Bachelor of Science in Informatics** program require students to develop web-based information systems to solve real-world problems. This comprehensive project is an essential demonstration of students' mastery of knowledge and skills acquired throughout the course. The project accounts for 30% of the final course grade. Typically spanning eight to ten weeks from its initiation to completion, this multifaceted project consists of multiple phases, with specific deliverables required at each stage.

The nature of this project is inherently collaborative, as it operates within a team-based framework. Each team consists of 3 – 4 students drawn from the class. Students autonomously select their team members and establish teams according to their preferences. Subsequently, once these teams are formed, it is the general practice for team members to remain within the same group throughout the project unless unforeseen extraordinary circumstances necessitate a team member's reassignment.

While group work in pedagogy is supported by solid educational principles and presents numerous advantages, assessing team-based projects presents challenges due to the complex dynamics of teamwork and the various factors that impact project outcomes and success. When

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evaluating team-based projects, instructors often concentrate solely on the final deliverables (the product). However, it is essential to assess the project's process as well in order to gauge the team's collaboration, communication, and task execution throughout the lifecycle of the project.

Assessing the final deliverables provides insights into the overall quality and achievement of the group's goals. This evaluation dimension gauges the group's ability to synthesize information, apply concepts, and innovate solutions. However, a singular focus on the final deliverables overlooks the intricacies of teamwork. While collective outcomes may demonstrate group performance, individual contributions merit recognition. Incorporating individual reflections into the assessment process acknowledges each team member's unique efforts and learning journeys. It is paramount to recognize and reward individual endeavors within the team's collaborative context.

In response to the intricate challenges of assessing team-based projects comprehensively, I developed a multifaceted evaluation approach. This approach involves evaluating both the product and the process aspects of the project. One central component of assessing the process is peer evaluation, which allows students to rate and evaluate their peers across multiple categories. The outcomes of peer evaluation offer valuable insight into members' collaborative abilities, contributions to the team, and their overall performance within the group. These peer evaluation results are integrated into the calculation of each member's final project grade, so each member's contributions are accurately reflected in the grade. Given that individual peer evaluation outcomes may vary, it is likely for members within the same team to receive different project grades. This assessment approach underscores the principle that members who make greater and more substantial contributions to the project should merit higher scores, thereby promoting an equitable recognition of individual efforts and fostering a climate of inclusivity and accountability throughout the project's lifecycle.

By providing a more holistic assessment of team-based projects, this equitable assessment plays a pivotal role in promoting team members' contributions and discouraging instances of free-riding. It fosters an environment characterized by fairness, inclusivity, and motivation, wherein individual efforts are duly recognized and rewarded. Ultimately, this approach contributes to enhancing student learning, team dynamics and collaboration, and the project's overall success.

## **Implementation**

This assessment approach evaluates both the product and the process of team-based projects from start to finish. Three distinct scores are produced from the assessment: team score, peer evaluation score, and individual score, respectively.

The team score is determined through a meticulous evaluation of deliverables collectively submitted by the team at each project phase. During each project phase, students are furnished with a well-defined set of technical requirements and a list of system features to be implemented. These requirements are accompanied by a comprehensive rubric and grading criteria, elucidating the precise methods for assessing and scoring the deliverables. Consequently, each project phase results in an assigned score. As the project reaches its conclusion, these individual phase scores are methodically aggregated to yield the team score of the project.

The peer evaluation score arises from the peer evaluation process. The peer evaluation form is made available to students two weeks before the project's conclusion, and all students are required to complete the form. After the conclusion of the peer evaluation process, peer scores are calculated. The process of determining each member's peer score involves four key steps:

1. **Rating team peers:** Students assess their fellow team members using a scale of 1 to 5 across five distinct categories: amount of contribution, quality of work, accountability, cooperation, and communication. Each member can receive a maximum of 25 points from each peer.
2. **Calculating team average:** The team's average peer evaluation score is determined by summing and averaging all peer evaluation scores within a team.
3. **Calculating individual percentage:** Each team member's individual percentage is calculated by dividing their score by the team's average score. This percentage may be equal to 100% or fall below or exceed that threshold.
4. **Determining peer score:** The peer score is computed using the formula: team project score \* (individual percentage – 1). This calculation can yield a peer score of 0, a positive number, or a negative number.

After the team project score and the peer evaluation score have been independently determined, they are combined to calculate the individual score. This individual score reflects the team project score, indicating the overall project performance, and the peer evaluation score, which assesses the member's contributions within the team. By aggregating these two scores, we arrive at the individual score, which comprehensively assesses a member's performance and collaboration in the team-based project.

To allow students to submit their peer evaluation ratings online, I developed an electronic form and hosted it on the course's supplemental website, accessible through IU's Sitehost web server. Additionally, various scripts were created to execute the systematic calculations based on the previously described algorithm. In addition, supplementary educational resources were generated to enhance students' comprehension of the peer evaluation process and the underlying algorithm, including a “Final Project Peer Evaluation FAQs” page and a hypothetical example. These materials were thoughtfully designed to provide students with comprehensive guidance on the peer evaluation process and the utilization of the algorithm.

Furthermore, at each phase of the project, students are tasked with self-reporting their contributions within a dedicated group discussion assignment. This assignment is a graded component, ensuring that each participant actively engages with the task. The structured group discussion format offers a platform for transparency, as every team member can review and assess what their peers have reported regarding their contributions to the current project phase. Importantly, this approach serves as a mechanism for accountability, as students who did not contribute to the ongoing phase are expected to provide an explanatory account for their level of involvement.

## Value

Assessing team-based projects is a complex endeavor that extends beyond evaluating final outcomes. It entails understanding the intricate process of collaboration, communication, and teamwork, all while ensuring equitable recognition of individual efforts. Literature has revealed and emphasized the importance of assessing the process of team-based projects as being just as vital, if not more so, than assessing the final outcomes. Cohen & Lotan (2014) and Gillies (2016) highlighted that understanding and evaluating the process of collaboration can lead to more effective and high-quality learning outcomes. Johnson & Johnson (1998) emphasized the importance of assessing the quality of interactions and contributions within teams and argued that the process is integral to successful cooperative learning. Gokhale (1995) discussed in an article how collaborative learning enhances critical thinking skills and suggested that assessing the process of collaboration is crucial for fostering critical thinking among students.

Assessing the process of team-based projects aligns with the higher-order cognitive skills outlined in Bloom's taxonomy—namely, analysis, synthesis, and evaluation—by fostering critical thinking and reflective practices among students (Anderson et al., 2000). It also aligns significantly with the principles of inclusive education and fair assessment by promoting equitable participation, recognizing diverse contributions, and ensuring that every team member has a fair opportunity to succeed (Ainscow & Miles, 2008). By assessing the process of team-based projects, educators can ensure that assessment criteria are clear and that evaluations are based on objective measures of teamwork and collaboration so the assessment prioritizes impartiality, transparency, and consistency in evaluating student performance (Brookhart & McMillan, 2019).

Inclusive education promotes individual growth and development by recognizing that each student has unique strengths and areas for improvement. Assessing the process of team-based projects allows students to reflect on their own progress, receive feedback, and make adjustments to enhance their collaborative skills (Florian & Black-Hawkins, 2011).

Social learning theory, as proposed by Albert Bandura (1977), emphasizes the role of social interactions in the learning process. Assessing the process of team-based projects through peer evaluation embodies the essence of social learning, as it encourages students to observe, learn from, and provide feedback to their peers. This approach promotes the development of interpersonal skills and the ability to work effectively in a team, which are crucial in the modern workforce.

In conclusion, assessing the process of team-based projects through peer evaluation leverages the rich tapestry of educational theories to promote quality contributions and equitable assessment. By actively engaging students in constructing knowledge, modeling effective teamwork, and embracing inclusive principles, this approach not only enhances the educational experience but also equips students with essential collaborative skills for the future. It underscores the profound impact of pedagogical theory on effective teaching practices in modern education. It is a comprehensive and powerful method that seamlessly integrates these educational theories to

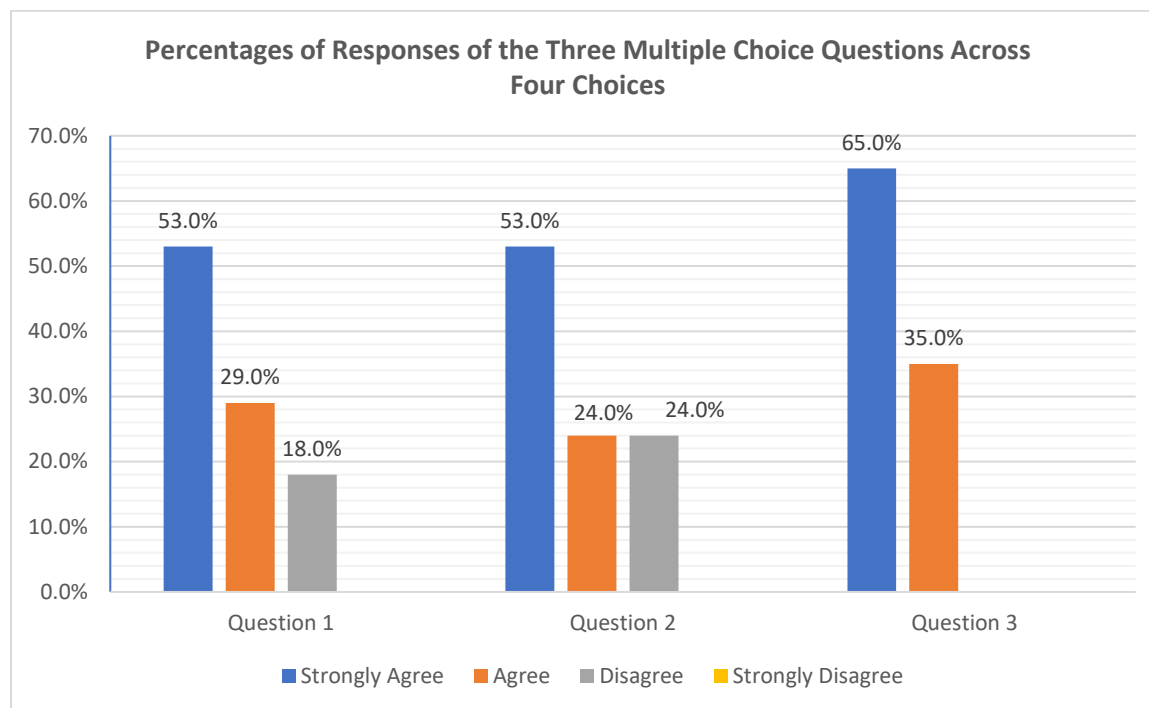
enrich the learning experience and prepare students for success in the complex and interconnected world of the 21st century.

### Student Response

I conducted a survey to gather student feedback on the peer evaluation process. The survey comprises three multiple-choice questions and three open-ended questions. These inquiries aimed to analyze student's perception of the effectiveness of peer evaluation in promoting active participation, quality contributions, and equitable assessment. All three of the multiple-choice questions in the survey offer the same set of four response options: a) strongly agree, b) agree, c) disagree, and d) strongly disagree. Following are the three multiple-choice questions:

- **Question 1:** Peer evaluation is an effective way to encourage participation and quality contributions from team members.
- **Question 2:** Peer evaluation is an effective tool for achieving fair assessment and providing better-informed grades for the team-based project.
- **Question 3:** The knowledge that I would be evaluated by my peers motivated me to participate actively in the team-based project.

The figure below shows how students' responses are distributed among the four choices for each of the three survey questions.



**Figure:** Percentages of Responses of the Three Multiple Choice Questions Across Four Choices

Most students chose "strongly agree" or "agree" for all three questions. The total percentages of the two choices for the three questions are 82%, 77%, and 100%, respectively. No one chose "strongly disagree" in any of the three questions.

When responding to the fourth open-ended question, "How did the peer evaluation influence the dynamics of the team? Did it promote a more collaborative and supportive work environment?" some students expressed that it had limited influence on team dynamics. However, most students believed it positively impacted collaboration and fostered a more supportive work environment. Below are selected excerpts from student responses to this question:

*It encouraged collaboration because there was a stake in the work they did, had they not done much work a low score would have been given, had they done good work a good score would have been given.*

*It encourages the team members to do a fair amount of work while also encouraging them to collaborate and support one another in the work being done.*

*The peer evaluations motivate me to work harder and be a better teammate for my peers.*

*Knowing that you will be graded by your groupmates at the end of the project prevents someone from being able to get away with doing nothing.*

*Seeing what we had to say about what each of us did for the project helps motivate us to do more in each phase and overall helped us to successfully complete the project.*

While answering the fifth open-ended question, "Did you feel comfortable providing feedback and evaluating your peers' contributions? Why or why not?" a few students hesitated to give low ratings. Factors such as small group sizes or the presence of friends in the same group contributed to this hesitation. However, most students reported feeling comfortable, particularly because they knew the evaluation results were anonymized.

In response to the sixth open-ended question, "In what ways do you think the peer evaluation process could be improved to encourage better participation, prompt quality contributions, and improve the fairness of assessment in the team-based project?", many students recommended conducting peer evaluation at multiple stages, such as at the middle of the project, in addition to the one conducted at the final stage.

### **Limitations**

Creating the electronic form for online peer evaluation requires some programming expertise, and a live web server is necessary to host the form. However, there are accessible alternatives, including popular platforms like Google Forms, Microsoft Forms, FireForm, Qualtrics, and SurveyMonkey, which can streamline this process.

Similarly, generating a script that automatically calculates peer scores by processing team scores and peer evaluation data based on the specified algorithm also necessitates programming skills and a live web server. An alternative to this method is Excel Spreadsheets. However, it requires manual input of team scores and peer evaluation results.

These alternative tools can simplify the process for those without extensive programming experience while achieving similar outcomes.

To encourage students to provide candid feedback, especially when it may be less favorable or involve lower ratings, it is essential to convey clearly that only the instructor will have access to the results. Furthermore, students should be assured that their evaluation results will remain confidential and will not be shared or discussed with anyone else.

In instances where the group size is relatively small, typically fewer than three members, the effectiveness of peer evaluation may be compromised. Students have expressed concerns in open-ended survey questions, citing apprehension about being critical of their group members.

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