

A Study of Differences between Peer Ratings and Self-Ratings in the Context of Collaborative Learning

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ABSTRACT

This study examines the difference between peer ratings and self-ratings to see how students who evaluate themselves more highly than their peers evaluate them differ from those who rate themselves poorly in the context of collaborative learning. My focus in this study is the various educational issues revealed by comparing self-evaluation with observation of peers. For this purpose, I selected 10 college students from a problem-based learning class, which requires teamwork, based on their peer ratings and self-rating scores: five students with the largest discrepancy between their own high self-evaluation and their peers' low evaluations of them and five students with the largest discrepancy between their own low self-evaluation and their peers' high evaluations of them. I compared the two groups using the Mann-Whitney U test and found that (1) students who evaluate themselves more highly than their peers rate them tend to be more positive in their self-reflection than those evaluate themselves poorly, and (2) the achievement scores of students who evaluate themselves more highly than peers are lower than those evaluate themselves poorly. Based on the study results, I discuss various implications.

Keywords: peer ratings, self-ratings, collaborative learning, problem-based learning, higher education

INTRODUCTION

Working together with peers in class, so-called "peer learning" is currently popular from kindergarten classrooms to university seminar rooms. Why is it so well-known in education? Hodgson, Brack, and Benson (2014) describe the merits of peer learning as enhancing cognitive development, motivation, and confidence, which come from questioning, answering, discussing, clarifying, giving examples, and giving and receiving feedback.

Peer learning can be defined as the acquisition of knowledge and skills by working together with peers who have similar social and ability levels (Topping, 2005). To be successful, peer learning must meet three conditions: (1) the emphasis should be on how each individual contributes to a team effort; (2) teachers should share responsibility with students in the assessment of learning in groups; and, (3) self-evaluation reports should be compared with observations from peers (Storm & Storm, 2011). Instructors need to take the third condition, comparing self-evaluations with peer evaluations, seriously. As Felchikov (2005) pointed out, "involving students in assessment is extremely helpful for cognitive development such as self-regulating skills." In this paper, I use "ratings" interchangeably with "evaluations."

Many studies on peer ratings and self-ratings show that they have positive educational effects. To see whether self-ratings and peer ratings help student learning and teamwork, Orsmond, Merry, and Reiling (2000) told freshmen students of biology to evaluate themselves and peers and found that those assessment activities enhanced the association between feedback and learning improvement. Peer ratings were also found to improve presentation performance (Cheng & Warren, 2005), and videotaped feedback for self-assessments improved oral presentation skills (Bourhis & Allen, 1998).

In spite of its advantages, peer learning is not always a preferred instructional methodology in colleges and universities. Instructors complain about the difficulty of measuring students' contributions to group work, and students are often unsatisfied with their grades based on group products or peer evaluations. Instructors agree that evaluating teamwork is one of their most perplexing obligations because they cannot witness the social dynamic of every cooperative group nor intuit how individual members influence one another (Johnson, Penny, & Gordon, 2009; Strom & Strom, 2011).

To make matters worse, when the instructor of a collaborative learning class includes the results of peer evaluations in the end-of-semester grades, students tend to be suspicious of the fairness of the peer evaluations. Both student self-ratings and peer ratings move much of the responsibility for evaluation to the students, whom they do not trust (Ballantyne, Hughes, & Mylonas, 2002; Fallows & Chandramohan, 2001). Therefore, most

instructors exclude peer evaluations as a major component of the final grades. Sahin (2008) described the negative aspects of peer evaluation: (1) students might not have the ability and maturity for evaluation; (2) students might not take the evaluation seriously; (3) students might have a negative attitude toward peer evaluation.

Students' negative attitudes toward peer evaluation and teachers' hesitation to use it suggest a need for a better use of peer evaluation in collaborative learning. As a first step, I compare evaluations by peers with self-evaluations to understand the relationship between them and elucidate the attitudes of instructors and students about peer- and self-evaluations. I also consider student self-reflection and achievement to understand peer- and self-evaluations from a broader perspective.

Therefore, my main purpose in this study is to examine the difference between peer ratings and self-ratings to see how students who evaluate themselves more highly than their peers evaluate them differ from those who rate themselves more poorly than their peers rate them in the context of collaborative learning. In other words, my focus is on comparing peer ratings of group work with self-ratings. The subjects of this study are from a capstone advanced level education course at a Korean university that uses problem-based learning, a form of collaborative learning. Next, I introduce some background knowledge about peer ratings, self-ratings, correlations between peer and self-ratings, collaborative learning, and problem-based learning, as theoretical supports for this study. I expect that comparing peer- and self-ratings of teamwork enables students to realize that "each of us is not only the individual we suppose ourselves to be but also the person seen by others" and that, finally, "learning to unite separate impressions can result in greater growth and achievement" (Strom & Strom, 2011).

THEORETICAL BACKGROUND

Peer Rating

Peer rating is a process by which each student evaluates how each of the other group members has exhibited certain traits, performed specific tasks, or accomplished particular objectives (Kane and Lawler, 1978). Peer ratings are widely used to hold students accountable for their behavior and performance in group assignments and to infuse validity into grades assigned to individuals for group work (Dingel & Wei, 2014). Peer ratings are gaining attention in higher education (Falchikov, 2001).

Brown (1998) described the advantages of peer evaluations as making students (1) take responsibility for their own learning, (2) understand evaluation as part of learning, (3) consider mistakes not as failure but as an opportunity for re-learning, (4) put skills into practice for knowledge transfer, (5) use peer evaluation as a form of self-evaluation, and (6) provide deep-learning instead of superficial learning. Kane and Lawler (1978) explained that peer ratings are most useful for collecting feedback about group members' specific behaviors. In addition, peer rating motivates and engages students with learning (Taras, 2010) and helps prepare students for the socially constructed and highly situated nature of learning in work and life settings (Boud & Falchikov, 2006).

The effects of peer ratings are more positive when the method for making them is fair and students' submissions are confidential (Kench, Field, Agudera, & Gill, 2009). Peer ratings can reduce the problem of free-riders, students who fail to shoulder their part of the work load in group projects, and foil attempts by students to reap unearned rewards (Roberts & McInnerney, 2007). Therefore, instructors could use peer evaluations to assign grades to students in an equitable way and adjust grades to ensure that students receive credit consistent with their contributions (Dingel, Wei, & Huq, 2013). Therefore, peer ratings, despite their low validity and reliability, are considered a useful instructional tool for collecting feedback about specific behaviors and the way each team member performed (Kane & Lawler, 1978).

Self-Ratings

Self-rating is a process by which students (1) monitor and evaluate the quality of their own thinking and behavior when learning and (2) identify strategies to improve their understanding and skills (McMillan & Hearn, 2008). It enables students to take a more active role in their own learning and could become an important long-term skill that raises the quality of their work without depending on others (Davies, 2002; Fallows & Chandramohan, 2001; Wiggins, 1998; Wolf, Bixby, Glenn, & Garner, 1991). Through self-ratings, students also develop critical thinking skills (Ozogul, Olina, & Sullivan, 2008). Furthermore, self-ratings can help students recognize when to think well of themselves and when to modify their behavior based on observations from their

peers (Strom & Strom, 2011).

In spite of their merits, self-ratings have shown mixed effects in education (Ozogul, Olina, & Sulliban, 2008). Students who were trained for self-evaluation showed higher academic achievement than those who were not (Fontana & Fernandes, 1994), but no effect was shown in students' writing of draft research reports using formative self-ratings (Olina & Sullivan, 2002, 2004).

Research Comparing Peer Ratings with Self-Ratings

Most studies comparing peer ratings with self-ratings focus on finding the relationship among faculty ratings, peer ratings, and self-ratings. Bergee (1993) compared evaluation results of music faculty, peer students, and students themselves on applied end-of-semester brass performances. The results showed that self-ratings correlated poorly with peer ratings and showed no consistent pattern of being higher or lower than others' evaluations (Bergee, 1997). As a follow-up study, Burgee (1997) used the same comparison of faculty, peers, and students themselves at three locations with college and university voice, percussion, woodwind, brass, and stringed instruments. Instructors evaluated a set of performances, and then performers rated the same set of performances, one of which was their own, on videotape. The results again showed that self-ratings correlated poorly with peer ratings.

On the other hand, in a review of previous studies, Ivanova and Rascevska (2012) found that people tend to evaluate themselves and those close to them more highly than they rated others and that more knowledgeable people tend to rate themselves lower than less knowledgeable people rate themselves. They concluded that no clear results on self-ratings emerged from the research. Nonetheless, Alfallay (2004) and Hafner and Hafner (2003) found self-ratings to be a valid evaluation skill.

Problem-Based Learning (PBL) as Collaborative Learning

Roseth, Johnson, and Johnson (2008) used meta-analyses of collaborative learning environments and found that cooperative learning improves social connections, encourages constructive behavior norms, and motivates optimism that most problems can be solved when collective action is applied in teams. Dingel, Wei, and Huq (2013) reviewed studies of collaborative learning and found that its benefits include student reports that teamwork is beneficial and motivating (Bartle, Dook, & Mocerino, 2011) and confidence- and responsibility-building (Caulfield & Persell, 2006). Rau and Heyl (1990) also found that collaborative learning strategies such as discussing material in teams can increase both students' test scores and their connections to classmates. Cooperative learning provides ideal conditions for comparing self-ratings with peer ratings, which are also understood as observations by teammates (Strom & Strom, 2011).

PBL, a core instructional methodology of collaborative learning, is a student-centered approach to instruction in which students learn material in small groups by addressing or solving an authentic and complex problem (Elder, 2019). PBL helps students learn skills for problem-solving, collaboration, and self-directed learning and increases their adaptive knowledge and mastery motivation (Hmelo-Silver, 2004). Barrow and Tamblin (1980) describe the primary characteristics of PBL as (1) learners begin learning by addressing simulations of authentic, ill-structured problems, (2) instructors do not dictate the learning activities, but rather serve in a supportive role, (3) students individually and collaboratively assume responsibility for generating learning issues and processes through self-assessment and peer assessment and access their own experiential knowledge and learning materials, (4) learners monitor their understanding and adjust their own strategies for learning, and (5) instructors support and model reasoning processes, facilitate group processes and interpersonal dynamics, and probe students' knowledge deeply.

METHODOLOGY

Sample and Procedure

The subjects in this study are college students in an advanced education course that combines PBL and lectures. Three problem-based cases are covered in the class, each lasting two to three weeks. Lectures are given between PBLs. The role of peers is essential to be successful in PBL group work. Each PBL occurs in 3 groups with randomly assigned members.

All students are required to complete peer and self-ratings at the end of each PBL case along with forms

of self-reflection. Based on the average scores of peer- and self-evaluations across 3 PBLs, I selected 10 students for this study: five students with the largest discrepancy between their own high self-evaluation and their peers' low evaluations of them and five students with the largest discrepancy between their own low self-evaluation and their peers' high evaluations of them. Demographic information for those 10 students is shown in Table 1. Students who evaluated themselves more highly than their peers evaluated them are Group1, and those who evaluated themselves more poorly than their peers evaluated them are Group2. More female students than male ones and more junior and senior students than freshmen and sophomores are included in the study.

Table 1. Demographic information for subjects

Variables		Group1	Group2	Total
Gender	Male	1	2	3
	Female	4	3	7
School Year	Freshman	0	0	0
	Sophomore	2	1	3
	Junior	2	2	4
	Senior	1	2	3
Total		5	5	10

Measures

Peer- and Self-Ratings

The measuring tool for peer ratings is based on peer assessment research for contributions to a group project done by Lejk & Wyvill (2001). The 6 items are listed in Table 2. To facilitate the comparison of the peer- and self-ratings, students used the same questions for both evaluations. Although the categories relate mainly to students' contributions to the group work, item 4 refers to proficiency in documentation and item 6 refers to the ability to provide solutions and create designs, which reflect contribution to a final product (Lejk & Wyvill, 2001). For each item, students are asked to rate the strength of their agreement/disagreement on a five point numeric scale. The students of each group submitted a confidential evaluation of the contributions and professionalism of each of their group's members in doing research and preparing and offering the PBL case tutorial.

Table 2. Peer- and self-rating form

Item #	Description
1	Motivation/Responsibility/Time Management Indicators: attends meetings regularly and on time, accepts fair share of work and reliably completes by the required time.
2	Adaptability Indicators: wide range of skills, readily accepts changed approach or constructive criticism.
3	Creativity/Originality Indicators: problem solver, originates new ideas, initiates team decisions.
4	Communication Skills Indicators: effective in discussions, good listener, able presenter
5	General Team Skills Indicators: positive attitude, encourager, supporter of group decisions, desire for consensus.
6	Technical Skills Indicators: provides technical solutions to problems, ability to create designs on own initiative.

Self-Reflection

Self-reflection is a tendency to focus on oneself repeatedly (Harrington & Loffredo, 2011) and is essential for successful group work in PBL activities. In the class on which this study is based, students are asked to reflect on what they have done during the whole PBL process at the end of each PBL case.

The self-reflection form used is based on the study of Das, Mpofu, Dunn, & Lanphear (1998), who adapted and modified the original self-evaluation form of Rangachari & Crankshaw (1992), who developed it

specifically for PBL students. For the purpose of this study, I used the self-evaluation form to capture students' reflections on their PBL group work. The self-reflection survey is composed of 15 questions about responsibility (5 items), information processing (3 items), communication (2 items), critical analysis (3 items), and self-awareness (2 items). Students are asked to indicate the strength of their agreement/disagreement on a five point scale with 1 representing disagreement and 5 agreement. To strengthen students' reflection, I included a few open-ended questions that are not on the original evaluation form.

Achievement

Students' achievement scores are based on their end-of-semester grade in the class. The grade is a composite score of 1 paper-and-pencil exam (20%), three PBL product evaluations (60%), and class attendance (20%). The grades range from 1 to 100.

STUDY LIMITATIONS

This study has a few limitations. First, the sample size is not large enough to generalize the results. Cooperative learning classes typically prefer small class sizes to maximize the learning effects, which made it impossible for me to secure a larger number of subjects for this study. Second, the measuring instrument for self-reflection was originally made for self evaluation among students taking PBL courses. In the absence of a PBL-specific self-reflection form, I modified the PBL self-evaluation form. Because my instrument has not been validated as a self-reflection form, its use might weaken the self-reflection results in this study.

FINDINGS

Descriptive statistics of the two comparison groups shows that average score of self-ratings and peer-ratings reflect the construction of the groups for maximum discrepancy between self- and peer-ratings in opposite directions (Table 3). The self-reflection scores of Group1 are higher than those in Group2, but the students in Group2 achieved higher grades than those in Group1.

Table 3. Descriptive Statistics of Comparison Groups

Variables	Group1			Group2			Total		
	n	M	SD	n	M	SD	n	M	SD
Self rating	5	28.37	1.81	5	24.90	1.50	10	26.63	2.41
Peer rating	5	24.22	2.20	5	27.05	1.40	10	25.63	2.29
Self-reflection	5	4.80	.13	5	4.38	.27	10	4.59	.30
Achievement	5	75.87	4.51	5	86.70	3.29	10	81.28	6.81

To determine whether Group1 and Group2 differ significantly in self-reflection, I compared those scores using the Mann-Whitney U test (Table 4). The difference between Group1 and Group2 in self-reflection is significant, implying that the mean difference between Group1 and Group2 in Table 3 is meaningful.

Table 4. Mann-Whitney U Test on Self-reflection in the Comparison Groups

Variable	Group	n	Mean Rank	Sum of Ranks	U
Self-Reflection	1	5	7.80	39.00	1.00*
	2	5	3.20	16.00	

* $p < .05$

To determine whether Group1 and Group2 differ significantly in achievement, I compared the students' end-of-semester grades using the Mann-Whitney U Test (Table 5). The difference between Group1 and Group2 in student achievement is significant, implying that the mean difference in student achievement between Group1 and Group2 shown in Table 3 is meaningful.

Table 5. Mann-Whitney U Test on Achievement in the Comparison Groups

Variable	Group	n	Mean Rank	Sum of Ranks	U
Achievement	1	5	3.10	15.50	.50**
	2	5	7.90	39.50	

** $p < .01$

DISCUSSION AND CONCLUSION

In this study, I looked for differences between students who evaluate themselves more highly than their peers evaluate them and those who evaluate themselves more poorly than their peers evaluate them in a collaborative learning class using PBL. The result of this study will promote understanding of students' peer- and self-ratings so educators and educational specialists can make student participation more effective and fair in colleges and universities.

I grouped the students in this study by their evaluation patterns. One group was more favorable to themselves than to their peers when assessing contributions to group work, and the other was less favorable to themselves than to others. The former group scored higher than the latter group in self-reflection, but their grades at the end of the class were lower than those in the latter group. In other words, students who evaluate themselves more poorly than they evaluate their peers have higher end-of-semester grades than those who do the opposite, although they think they focus less on themselves in reflecting on their behaviors during group work.

Those results have a few implications for using students' peer- and self-evaluations to measure students' contributions in collaborative classes. First, students' self-ratings should probably not be used as a major portion of students' grades; students who score themselves highly tend to be low in their achievement as reflected by their end-of-semester grades. Clearly, some students are inclined to overestimate their abilities or contributions to group work over that of their peers. On the other hand, peer ratings are to be more recommended because high peer ratings predicted high achievement in this study.

From these findings, I cautiously predict that students in collaborative learning can overestimate their contributions to group work, which confirms the study of Bergee (1997), which revealed that students' self-ratings correlated poorly with peer ratings, whereas faculty ratings correlated strongly with peer ratings. If faculty ratings are equivalent to achievement scores, the first implication is easily understood. Nevertheless, self-ratings remain an important factor in education; Alfalay (2004) and Hafner and Hafner (2003) maintain that self-ratings are as valid as peer ratings in learning. Self-ratings do have the potential to improve student performance, develop critical thinking skills, and enable students to take a more active role in their own learning (Davis, 2002; Ozogul, Olina, & Sullivan, 2008).

Second, this study reveals that students' high self-reflection scores are correlated with low achievement scores, implying that self-reflection doesn't positively influence academic achievement. The finding could imply that self-reflection in collaborative learning does not in fact promote positive self-esteem, modifying behaviors based on observation of peers, and improving work quality without relying heavily on others as predicted (Fallows & Chandramohan, 2001; Ozogul, Olina, & Sullivan, 2008; Strom & Strom, 2011).

Any connection drawn between self-reflection and achievement must be cautious. But given the prediction that the process of doing self-reflection would improve the quality of an individual's group work and that one reasonable index of student improvement is end-of-semester grades, high self-rating scores could be expected to correlate with high grades. But that was not the finding in this study. Therefore, student self-reflection does not always correlate with positive outcomes in learning. More studies on the effects of self-reflection on educational outputs should be performed.

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