

## **An Attributional Approach to Self and Peer Assessment for Collaborative Learning Projects**

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### **ABSTRACT**

*This paper describes an instrument for assessing self and peer contributions to group projects. The instrument used research from an attributional framework to derive a set of criteria on which students rate themselves and their peers. Data collected in an undergraduate education class suggest that the instrument is reliable and valid for peer assessment, but not for self assessment. Advantages and disadvantages of the instrument are discussed.*

Small group learning is widely recognized and used as an instructional technique with important benefits for students (Antil, Jenkins, Wayne, & Vadasy, 1998; Falchikov & Magin, 1997; Lopez-Real & Yin-Ping, 1999; Webb & Palincsar, 1996). The most familiar method of small group learning, cooperative learning, is typically structured in such a way that students facilitate peer learning in small groups, but achievement outcomes are individual and often assessed with quizzes. Group reward structures are used that encourage individual accountability, such as basing rewards on the average of individual team members' quiz scores (Slavin, 1996). Therefore, although students work cooperatively, their learning is assessed individually. Research reviews have indicated that individual accountability is important for learning since it provides each student in a group with the incentive to put forth maximum effort (Slavin, 1996).

More recent models of small group work have shifted the emphasis to group collaboration, where students work together to complete an authentic project or solve complex problems (e.g. Blumenfeld, Marx, Soloway, & Krajcik, 1996; Webb, Nemer, Chizhik, & Sugrue, 1998). In collaborative learning, individual contributions are less clear, leaving open the possibility of social loafing or freeloading (Webb & Palincsar, 1996). In spite of this possibility, arguments have been made that individual accountability is unnecessary, especially when students are engaged in interesting, complex tasks (Cohen, 1994). Nonetheless, a common motivational problem with collaborative projects occurs when students perceive that group mates are not contributing their fair share (Overbey & Peterson, 1997). When projects are completed in class, teachers can assess students' contributions to the group. However, if projects are completed out of class, this becomes impossible or at best burdensome (Falchikov & Magin, 1997). To overcome this problem, peer assessments of contributions to group projects have been suggested as a feasible method to encourage individual accountability (Topping, 1998).

Three basic methods of peer assessment include peer nomination, peer ranking, and peer ratings (Kane & Lawler, 1978). Peer nomination involves each member of the group nominating the member who is perceived to be the highest in the group on a characteristic or set of characteristics relevant to the assessment. Peer ranking involves rank ordering all members of the group from highest to lowest on a characteristic or set

of characteristics. These two methods are both based on competitive goal structures, in which some students will by definition receive higher evaluations than others. Because collaborative tasks are designed to encourage cooperation rather than competition, peer rating is the most logical choice for assessment of individuals' contributions to collaborative projects. In addition, Dochy, Segers, and Sluijsmans (1999) advocate the combination of self and peer assessment in order to prevent problems of under- and over-marking peers based on irrelevant factors such as friendship.

In the rating method of self and peer assessment described in this paper, the characteristics on which students are rated were derived from Weiner's (1986) attribution theory of motivation. A central tenet of attribution theory is that students seek understanding of their academic achievement, making causal attributions to explain specific achievement outcomes. These attributions are important in understanding motivation, because they result in two important motivation-related consequences: esteem-related affective reactions to performances, and expectancy for future success. Thus, not only does this approach provide rating criteria derived from students' own explanations of their achievement outcomes, but it also provides valuable information concerning students' motivation for teachers who wish to take advantage of it. This paper describes the development of the attributional instrument, evidence for the reliability and validity of the instrument, and advantages and disadvantages of using this instrument.

## **Method**

### **Development of the Attribution Assessment Instrument**

Two research studies provided the basis on which this instrument was developed. First, Peterson (1992a) asked 84 undergraduate students to respond to two hypothetical performance situations depicting group success or failure on a class project. Based on recommendations by Elig and Frieze (1979) that an open-ended format be used to examine typical attributions made by students for achievement situations not previously researched, participants in this study were asked to explain the most likely cause(s) for each outcome. Coding of these responses resulted in a list of 10 attributions: ability or

knowledge in the subject area, effort, strategy(ies) to complete the task, motivation/attitude, understanding of the task, getting along with group members, mood or illness, scheduling factors, nature of the task, and help from the teacher.

In the second study (Peterson, 1992b) 96 undergraduates were assigned to groups of four to complete a group project for an education class. After receiving feedback on the project, students were given a questionnaire in which they were asked to write a brief statement explaining the cause or causes of their group's outcome on the project. These open-ended responses were coded, resulting in a list of 8 attributions: ability or knowledge in the subject area, effort, strategy(ies) to complete the task, motivation/attitude, understanding of the task, getting along with group members, mood or illness, and scheduling factors. This list is identical to that found in Peterson (1992a) with the exception that in this study students did not list nature of the task or help from the teacher as causal factors in their outcome on the projects. Because the 8 attributions found in both studies by Peterson are directly relevant to assessing self and peer contributions, they were chosen for inclusion in the assessment instrument. The two additional attributions found in Peterson (1992a) nature of the task, and help from the teacher, are not relevant to assessing self or peer contributions to a project, and thus were not included.

For each of the eight attributions, students respond on a 7-point scale ranging from +3 (this factor contributed to the group's outcome in a significantly positive direction), through 0 (this factor had no impact on the outcome), to -3 (this factor contributed significantly in a negative direction). Students respond to this set of items for themselves and for each member of their group (see Appendix for this instrument).

## **Results and Discussion**

### **Reliability and Validity of Attribution Assessment Instrument**

**Reliability.** In a study conducted by Peterson (1999) 24 undergraduates were paired with a classmate to complete a series of class projects. Students responded to the assessment instrument following the first two pairs of projects and then again following the second two pairs of projects. Data from the Peterson (1999) study were used to

examine test–retest reliability. Self and partner scores for each of the 8 attributions, as well as the total score were correlated on the first and second administrations of the instrument. Descriptive statistics are presented in Table 1 and test–rest correlations are presented in Table 2.

As can be seen in Table 2, only 4 of the test–retest correlations were significant for self–attributions, while 6 of the correlations were significant for partner attributions. Moreover, the two nonsignificant attributions for partner approached the conventional .05 level of significance ( $p = .059$ ). Test–retest correlations were expected to be moderate for two reasons. First, attributions are situation–specific and therefore likely to change somewhat for different projects. Second, the number of subjects in this study was small. Given these two factors, the test–retest correlations for partner attributions can be considered very high. Correlations for self–attributions were considerably lower, probably due to the more restricted range of self assessments. Although research is needed with a larger sample of subjects, these results indicate that the assessment instrument is reliable for peer assessment, but not for self assessment.

**Content validity.** Content validity of the attribution assessment instrument was established by using results of two research studies in its design (Peterson, 1992a; 1992b). The list of 8 attributions was established first with hypothetical achievement scenarios and second with authentic group tasks. It is recommended that if this instrument is to be used with different types of students or in different types of collaborative settings, data first be collected to establish valid lists of attributions.

**Criterion validity.** One method of establishing criterion validity is to use scores from the assessment instrument to predict scores on a related variable. At the end of the assessment instrument, Peterson (1999) also asked students to distribute 100 points to themselves and their partner to reflect the contribution of each, known as zero sum method (Matthews, 1994). Two–tailed tests of significance indicated that the correlations for partner were significant at the  $p < .01$  level, while correlations for self were nonsignificant (see Table 3). This data provides preliminary evidence for criterion validity of peer assessment but not self assessment.

## **Advantages and Limitations of the Peer Evaluation Technique**

A major advantage of this assessment instrument is its flexibility for use with any group project. Several other peer assessment techniques described in the research literature derive their rating criteria from specific aspects of the project (e.g. Conway, R., Kember, D., Sivan, A., & Wu, M., 1993; Goldfinch, 1994; Lopez-Real & Yin-Ping, 1999; Matthews, 1994) and therefore are project-specific. Teachers and students can work together to determine if other attributions should be added to the list, since a review of research suggests that it is important to involve students in developing assessment criteria (Dochy et al., 1999). In addition, the instrument is easily adapted to groups of any size, and for groups of up to four, requires only one page and about 5 to 10 minutes of the students' time. The instrument is easily scored by hand, but could also be scored by computer. If necessary, space can be provided for students' comments so they can explain their ratings.

Another aspect of flexibility is that teachers can calculate different types of scores for students, depending on the goal of the assessment. For example, in Peterson (1993; 1999) scores on the effort item were used to consider adjusting a student's group grade. If a student received a low score on effort from one or more partners, the students in that group were asked to consult with the teacher individually. If the teacher determined that the student had failed to contribute equally to the project, the score was adjusted downward. Likewise, if it was determined that a student contributed significantly more than their share, but the project received a lower grade because of lack of effort on the part of other group members, then the teacher considered adjusting the grade upward. In Peterson and Overbey (1997) the instructor totaled each student's score on all 8 attribution items, averaged them across each member of the group, and then developed a scale for adjusting group scores downward; no upward adjustments were made. In Peterson and Myer (1995) total attribution scores were used to assign a separate individual grade in addition to the group grade on the project. These examples illustrate how the assessment form provides maximum flexibility in scoring.

A second major advantage of this technique is that because it is based on attribution theory, information collected from the peer assessment can be used by teachers

to discover possible motivational consequences of cooperative learning activities. For example, some of the attributions are typically perceived by students as controllable (e.g. effort, motivation/attitude), whereas others are perceived as uncontrollable (e.g. ability, illness). Research suggests that students are more willing to help other students when their need for help is based on uncontrollable factors such as lack of ability rather than controllable factors such as lack of effort (Graham, 1991). Another example of motivational information concerns the stability of students' attributions. Some attributions are typically perceived as more stable or unchangeable (e.g. ability, motivation) whereas others are perceived as relatively unstable (e.g. understanding, getting along with others). Research suggests that students who attribute performance to stable causes expect similar performance outcomes in the future (Graham, 1991). This consequence is particularly harmful for students in groups with low grades, since they expect similarly poor performance outcomes on future projects with the same group. Teachers who are knowledgeable about these aspects of attribution theory can use information obtained from the assessments in assigning students to groups. (For a thorough discussion of motivational consequences in group settings see Weiner, 1995).

One potential limitation of this self and peer assessment technique is that it may be difficult for younger students to understand, although it could certainly be used by high school students with adequate explanation. Another limitation is that the list of attributions may not be exhaustive in terms of relevant characteristics to be evaluated. This problem is easily solved, however, by simply adding these characteristics to the list.

A third, and potentially more serious limitation, is that students may give unduly high or low ratings to other groups members based on some irrelevant characteristic. This halo effect problem arises with any type of rating scale, and must be dealt with when rating scales are used for peer assessment. A fourth potential limitation, based on previous research (Peterson, 1993) is that students' ratings for their partners are affected by their prior academic achievement. This means that lower ability students in cooperative groups may receive lower ratings from their higher-achieving peers in spite of working hard to contribute to the group outcome. Several techniques can be used to minimize these two potential problems. First, when groups of three or more are used, students' ratings

from their partners can be averaged, so that low scores from a given individual will carry less weight. Second, differential weighting can be placed on effort if that is deemed more important than ability. Third, if mixed ability groups are used, then some students will not be unequally penalized by being placed in a group with more high-ability members.

A fifth limitation is that students' self-assessments may be of limited use since the data suggests that students tend to rate themselves very high regardless of the grade they received on the project. Moreover, data presented in this paper indicates that the assessment instrument lacks test-retest reliability and criterion validity for self assessments.

### **Recommendations for Future Research**

Future research using this technique should continue to explore reliability and validity with different groups of students and different projects. Regarding reliability, the scales are not expected to be internally consistent since they are measuring very different aspects of a person's contribution to a group project. However, test-retest reliability should be moderately high, and further research could shed light on the lack of reliability for self assessments.

Future research should also further examine the validity of the instrument by exploring the relationships between different types of scores calculated from the self and peer assessments and other variables such as grades on the project.

With small-group learning becoming increasingly popular, it is important for educators, particularly those working with post-high school students, to have a mechanism for ensuring individual accountability in groups. The attributional approach to self and peer assessment described in this paper offers a theoretically-based technique that will contribute to research and practice in cooperative learning.



**Table 1**  
Descriptive statistics for self and partner attributions

Attribution	Self attributions (N=23)				Partner attributions (N=22)			
	Time 1		Time 2		Time 1		Time 2	
	M	SD	M	SD	M	SD	M	SD
Ability	6.17	.58	6.46	.59	6.17	.83	6.61	.66
Effort	6.83	.39	6.88	.45	6.43	1.34	6.74	.75
Strategy	6.61	.58	6.75	.44	6.39	.72	6.70	.63
Motivation	6.74	.54	6.88	.34	6.13	1.46	6.70	.88
Understanding	5.96	.82	6.46	.59	5.91	1.16	6.57	.59
Getting along	6.74	.75	6.88	.34	6.65	.83	6.96	.21
Mood	5.00	1.38	5.75	1.57	5.17	1.47	6.04	1.33
Scheduling	6.04	1.19	6.04	1.33	5.83	1.70	5.96	1.49
Total	6.26	.42	6.51	.53	6.09	.89	6.53	.66

Note: To eliminate negative numbers in the data analysis, scores were converted from the original which ranged from -3 to +3 to a scale which ranged from 1 to 7.

**Table 2**  
Test-retest correlations for self and partner attributions

Attribution	Self attributions (N=23)	Partner attributions (N=22)
	Ability	.141
Effort	.465*	.882**
Strategy	.008	.664**
Motivation	.431*	.889**
Understanding	.137	.409
Getting along	.520*	.431*
Mood	.433*	.575**
Scheduling	-.059	.408
Total	.459*	.808**

\*  $p < .05$  (2-tailed).

\*\*  $p < .01$  (2-tailed).

**Table 3**

Correlations between total attribution scores and zero-sum contribution scores

Attributions	First Administration	Second Administration
Self Attributions	-.028	.264
Partner Attributions	.805**	.724**

\*\*  $p < .01$  (2-tailed).

## Appendix

**DIRECTIONS:** This questionnaire is designed to evaluate you and your partner's performance on your projects. Please answer the questions as honestly as possible. Your partner(s) will not see your answers.

For the following sets of questions, you are to write in your name and then the name of your partner(s), and then respond to the questions in relation to that specific person. For each question, first decide if that factor made a positive or negative contribution to your group's outcome on the project, and respond on the following scale:

- +3 the factor contributed significantly in a positive direction.
- +2 the factor contributed moderately in a positive direction.
- +1 the factor contributed slightly in a positive direction.
- 0 the factor had no impact on the outcome.
- 1 the factor contributed slightly in a negative direction.
- 2 the factor contributed moderately in a negative direction.
- 3 the factor contributed significantly in a negative direction.

Questions 1 – 8 refer to yourself:

To what extent did each of the following factors contribute to your group's outcome?

- |                                      |    |    |    |   |    |    |    |
|--------------------------------------|----|----|----|---|----|----|----|
| 1. Ability/knowledge in subject area | +3 | +2 | +1 | 0 | -1 | -2 | -3 |
| 2. Effort                            | +3 | +2 | +1 | 0 | -1 | -2 | -3 |
| 3. Strategy(ies) to complete project | +3 | +2 | +1 | 0 | -1 | -2 | -3 |
| 4. Motivation/attitude               | +3 | +2 | +1 | 0 | -1 | -2 | -3 |
| 5. Understanding of the task         | +3 | +2 | +1 | 0 | -1 | -2 | -3 |
| 6. Getting along with group members  | +3 | +2 | +1 | 0 | -1 | -2 | -3 |
| 7. Mood/illness                      | +3 | +2 | +1 | 0 | -1 | -2 | -3 |
| 8. Scheduling factors                | +3 | +2 | +1 | 0 | -1 | -2 | -3 |

Questions 9-16 refer to \_\_\_\_\_ (fill in name of your partner)

To what extent did each of the following factors (concerning the group member you just named) contribute to your group's outcome?

- |                                       |    |    |    |   |    |    |    |
|---------------------------------------|----|----|----|---|----|----|----|
| 9. Ability/knowledge in subject area  | +3 | +2 | +1 | 0 | -1 | -2 | -3 |
| 10. Effort                            | +3 | +2 | +1 | 0 | -1 | -2 | -3 |
| 11. Strategy(ies) to complete project | +3 | +2 | +1 | 0 | -1 | -2 | -3 |
| 12. Motivation/attitude               | +3 | +2 | +1 | 0 | -1 | -2 | -3 |
| 13. Understanding of the task         | +3 | +2 | +1 | 0 | -1 | -2 | -3 |
| 14. Getting along with group members  | +3 | +2 | +1 | 0 | -1 | -2 | -3 |
| 15. Mood/illness                      | +3 | +2 | +1 | 0 | -1 | -2 | -3 |
| 16. Scheduling factors                | +3 | +2 | +1 | 0 | -1 | -2 | -3 |

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