

# A Comparison of Computer-Supported Collaborative Learning Forms in Terms of Interaction and Peer Trust

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**Abstract:** Previous research on collaborative learning has predominantly examined single collaborative forms and focused more on cognitive processes than on social and emotional dimensions. This study compared three forms of collaborative learning, namely group work, forums, and peer tutoring, in terms of their effects on students' ratings of interaction and peer trust. The results indicate that group work received the highest overall interaction ratings. Peer tutoring ranked second in cognitive interaction, whereas forums ranked second in social interaction. Regarding peer trust, group work achieved the highest ratings for goodwill trust, while forums received the lowest ratings. The findings disclose implications for data-driven learner modelling for collaborative learning. Tracking changes in students' social interaction ratings tends to be important in peer tutoring contexts, and differences among the three collaborative learning forms could inform the use of interactional indicators in predicting pair-level trust.

**Keywords:** Computer-supported collaborative learning, group work, forums, peer tutoring, interaction, peer trust

## 1. Introduction

Collaborative learning (CL) encompasses multiple forms, including group work (GW), forums (FR), and peer tutoring (PT). While each form has distinct characteristics, most prior research has focused on single CL forms without comparative analysis. This study addresses the gap by examining differences in interaction and peer trust, two key social-emotional factors that support effective collaboration (Huang & Lajoie, 2023; Simeone & Eneau, 2009), across GW, FR, and PT. Investigating social-emotional dimensions is essential, as existing research has emphasized emotions in individual learning (IL) or cognitive aspects of CL, rather than shared social-emotional processes within CL (Huang & Lajoie, 2023).

Digital tools for CL facilitate the tracking of learning log data, and algorithms support automatic grouping and pairing (Jiang et al., 2024; Liang et al., 2021). Although these data-driven approaches enhance timely monitoring and intervention in CL (Liang et al., 2021), they have largely focused on individual cognitive indicators. Therefore, social-emotional indicators deserve further examination, as their cyclical use in monitoring and predicting learning processes could better promote CL. Interaction and peer trust are two such pair-level indicators: (1) Interaction in CL can be categorized into cognitive interactions, referring to knowledge co-constructions, and social interactions, referring to the exchange of emotions (Li et al., 2024). (2) Peer trust can be divided into competence trust, the belief in a peer's task-related ability, and goodwill trust, the belief that a peer will respect commitments (Simeone & Eneau, 2009). Accordingly, two research questions were developed:

RQ1. Which CL forms foster cognitive and social interactions?

RQ2. Which CL forms foster competence and goodwill trust?

## 2. Methods

## 2.1 Learning Context

The study was conducted in an English academic paper reading course at a Japanese university. The course targeted undergraduate students and spanned 14 weeks, with one 90-minute session per week. The instructor implemented CL activities almost every week, including GW, FR, and PT. Table 1 presents the learning activities and task descriptions.

Table 1. *An Overview of the Learning Activities Conducted Each Week*

Week	Learning Forms	# of Students (# of raters)	Task Description
1	IL; GW	32	Individually read papers and discuss
2	IL; GW; FR	34; 5	reading strategies and material
3	IL; GW	31	contents
4	IL; GW; FR	30; 19	
5	IL; GW	29	
6	IL		Write a summary and discussion
7	FR	25 (18)	Peer review and provide feedback
8	GW	21 (21)	Discuss peer feedback
9	IL		Write a summary and discussion
10	PT	27 (26)	Peer review and provide feedback
11	GW	28 (26)	Discuss peer feedback
12	IL		Write a summary and discussion
13	PT	27 (24)	Peer review and provide feedback
14	GW	19 (19)	Discuss peer feedback

In **individual learning (IL)**, during the first five weeks, students read instructor-assigned papers individually before engaging in discussions. From Weeks 6 to 14, activities followed a three-week cycle consisting of IL, peer review, and GW. In the first week of each cycle, students selected a paper, read it individually, and wrote a summary and discussion.

**Group work (GW)** was supported by a group formation system and a peer evaluation system within the Group Learning Orchestration Based on Evidence (GLOBE) framework (Liang et al., 2021). The group formation system assists instructors in creating groups based on students' prior learning behaviors or knowledge proficiency. The peer evaluation system allows students to rate group members after completing tasks. From Weeks 1 to 5, groups were formed based on students' operations in IL. From Weeks 6 to 14, grouping was based on students' English vocabulary proficiency measured during Weeks 1 to 5. Groups were typically composed of three to five members, and GW was conducted face-to-face. At the end of each session, students presented their discussion in text (Weeks 1-5) or verbally (Weeks 6-14) and rated their group members.

**Forum (FR)** activities were conducted using the discussion forum in Moodle. The platform allowed students to create posts, view peers' contributions, and respond freely. Students could view all posts and reply to any peer without limitation, except in Week 7, when each student was restricted to replying to one post. FR activities were conducted online. In Weeks 2 and 4, students shared their opinions in their replies. In Week 7, students selected one peer's summary and discussion and provided a peer review.

**Peer tutoring (PT)** activities were conducted using the peer help system (Jiang et al., 2024) in the GLOBE framework. The system enables students to post questions and provides anonymized algorithm-based recommendations based on students' knowledge data. In this learning context, students posted their summaries and discussions in the system to request peer review from classmates. In Week 10, students received a list of recommended peer reviewers when posting and selected one from the list. In Week 13, peer reviewers received a list of recommended posts and selected one summary to review. The system supported one-to-one matching (although some students received two feedback depending on attendance) and was conducted online.

## 2.2 Measurements and Analysis Methods

Interaction was assessed through peer ratings after each CL activity. Ratings were anonymous; however, GW evaluations were conducted within groups. Because peer ratings of cognitive interaction were only implemented from Weeks 6 to 14, analyses of interaction included only data from these weeks. Cognitive interaction was measured using the item “How helpful was the review from your peer in refining your summary and discussion?” (FR and PT) or by assessing the completeness of peers’ summaries and discussions (GW; the average score of the summaries and discussions was used). Social interaction was measured by the extent to which the student felt their peers engaged in and committed to learning goals and interactions (Warkentin et al., 1997). All items were rated on a five-point Likert scale. Linear mixed-effects models (LMMs) were used to account for repeated measures across activities.

Peer trust was measured using a survey administered in Week 14. Students ranked CL forms based on how strongly each form fostered competence and goodwill trust. A total of 24 students responded to the survey, and 7 responses that did not provide a clear ranking (e.g., assigning the same rank to all CL forms) were excluded. Therefore, 17 valid responses remained. Competence trust was assessed with the item “I trust that my peers are capable of performing tasks in collaborative learning activities.” Goodwill trust was assessed with the item “I trust that my peers will do everything within their capacity to complete tasks with me in collaborative learning activities” (Ridings et al., 2002). Rankings were coded from 3 (highest) to 1 (lowest). Differences among CL forms were analyzed using the Kruskal–Wallis test, followed by Dunn’s post hoc test with Bonferroni adjustment.

## 3. Results

Table 2. *The Mean of Peer Ratings on Interaction and the Median of Peer Trust*

CL Forms	Peer Ratings on Interaction		Peer Trust	
	Cognitive Interaction	Social Interaction	Competence Trust	Goodwill Trust
GW	4.78 (N=190)	4.88 (N=190)	2.00 (N=17)	3.00 (N=17)
FR	4.50 (N=18)	4.67 (N=18)	2.00 (N=17)	1.00 (N=17)
PT	4.63 (N=54)	4.59 (N=54)	2.00 (N=17)	2.00 (N=17)

\*Note: In GW, the rating assigned to each member of the group was treated as a separate data point.

Regarding peer ratings on interaction, the results (Table 2) indicated that, for cognitive interaction, GW received the highest mean rating, followed by PT and FR. For social interaction, GW again received the highest mean rating, with FR ranked second and PT third. LMM results showed no significant differences among the three CL forms in cognitive interaction. However, for social interaction, PT received significantly lower mean ratings than GW ( $p = .013 < .05$ , effect size  $d = .397$ ).

Regarding peer trust, the results (Table 2) indicated that, for competence trust, GW, PT, and FR received equal median scores. For goodwill trust, GW again ranked highest, followed by PT and then FR. Kruskal–Wallis test results showed no significant differences among the three CL forms in competence trust ( $p = .354 > .05$ ). However, a significant difference was found for goodwill trust ( $p = .014 < .05$ , effect size  $\eta^2 = .135$ ). Post hoc analysis indicated that FR had a significantly lower median of goodwill trust than GW ( $p = .011 < .05$ , effect size  $\delta = .533$ ).

## 4. Discussion

As a preliminary study, this study compared GW, FR, and PT in terms of students’ interaction and trust. The findings provide implications for data-driven monitoring and prediction in CSCL. Because PT received significantly lower ratings for social interaction, tracking changes in students’ social interaction ratings may be important in PT in this context. In addition,

significant differences among CL forms were observed in goodwill trust. These differences could inform the weighting of instructional variables when developing predictive models of students' trust following CL activities in the same learning context.

A key limitation of this study is the lack of an experimental–control design with fixed sample sizes, durations, and intervention sequences, which may introduce statistical bias, especially in smaller groups. This limits the analysis of how specific CL forms and their characteristics influence interaction and trust. Although tentative interpretations are possible, future research should use well-designed experimental structures to examine these effects more rigorously. Tentative interpretations include increased social presence and interaction in GW's face-to-face format (Bali & Liu, 2018) and peer pressure influencing higher ratings (Güven et al., 2023). Pre-existing social relationships in FR may enhance perceived interaction, while data-driven matching in PT may better support cognitive interaction (Nurminen et al., 2017). However, the short-term and limited depth of FR activities may restrict the development of goodwill trust (Baturay & Toker, 2019).

In addition, this study relied on students' self-reported interaction and trust, which poses challenges for research on social and emotional factors, as reliance on a single data source may reduce objectivity (Huang & Lajoie, 2023). Future research could incorporate content analysis of student discussions to provide multimodal data. The small sample size and focus on English academic reading also limit statistical power and generalizability. Future research should include larger samples and examine other subject areas.

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