Advancing Understanding of Learning in Interaction: How Ways of Participating Can Influence Joint Performance and Learning

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ABSTRACT

An enduring issue for CSCL researchers involves developing methods of assessing collaborative interaction and tracing the quality of collaboration to learning outcomes. One critical question for research is whether we can identify relational and/or interactional resources that are important for generative collaboration. In this presentation, we will share research that examined the relationship between student interactions, group success, and subsequent individual performance on the same and a related problem solving measure.

Keywords

Alignment of goals, mutuality in interaction, joint attention, transfer of learning, quality of collaboration.

INTRODUCTION

Success in joint endeavors is often attributed to the knowledge-base resources that individuals uniquely bring to a collaborative situation. While individual resources are essential, recent research suggests that attention must also be paid to the ecology of relations that develops within interactions that make it possible (or not) for knowledge and other cognitive resources to be accessed, functionally expressed, and shared among group members. A number of accounts suggest that the quality and nature of collaboration within groups can differ even given objectively similar situations, and that while interactions emerge over time, and fluctuate on a moment-by moment basis, they can also be characterized broadly as falling on a continuum of productive interdependence. For example, Forman & Cazden (1985) found that different patterns of interaction emerged even given the same problem to solve. They described three styles of working together, "Parallel," "Associative," and "Cooperative," that evolved in the context of Piagetian isolation-of-variables problems and were characterized by increasing degrees of coordination. These findings point to a need to articulate further the dimensions of interaction and their potential consequences. The current research focuses on the relationship between the quality of interaction (as indicated by responses to solution proposals), group performance, and learning outcomes in the context of a mathematical problem solving activity.

METHODS

Participants

The data set includes twelve groups of high-achieving sixth grade students whose scores on the problem formed a bi-modal distribution. Triads were composed of same gender participants.

Materials and Procedures

The first episode in a series called *The Adventures of Jasper Woodbury* (Cognition and Technology Group at Vanderbilt, 1997) provided the mathematical problem-solving task used in this study. In order to solve the problem, students had to collect data embedded in the video presentation. Students solved the problem in same-gender groups of three. (see Barron, 2000a,b; Sears, Barron, & Strobel, 2001 for more detail).

RESULTS

Analysis of Response Patterns

The results from our coding of group interactions address two main questions: 1) Do the pattern of responses to correct proposals of students in successful and unsuccessful groups differ significantly; and 2) Do the pattern of response pairs differ significantly according to group success? All responses to correct proposals were categorized as engaged responses or non-engaged. Engaged responses took up the proposal in conversation and accepted or discussed it. Non-engaged responses included no verbal response or rejection of the proposal without rationale. As shown in Table 1, Chi square analyses indicated that successful groups made significantly more Engaged responses and significantly less Non-Engaged responses than unsuccessful groups, (*Chi sq*. (1) = 22.2, p = .000). Independent t-tests revealed that the proportion of Engaged responses produced by successful groups (M(7) = 66.46% (±7.47%)) was significantly higher than that of unsuccessful groups (M(4) = 41.75% (±26.04%), t = 5.904, $p < .05$). Thus, our analyses suggest that the groups did differ significantly, and in the direction that one would expect. It is interesting to note that the proportions are nearly inverted,

with successful groups producing a fairly high rate of Engaged responses (66.46%) while unsuccessful groups produce a fairly high rate of Non-Engaged responses (58.75%).

In addition to looking at individual responses to correct proposals, we examined response pairs. It is important to realize that when people work in groups, often one person's response is taken to be the group's response, especially if the other group members remain silent. Thus, to determine whether responses to correct proposals were different at the group level (e.g. both partners) and not just at the individual level between successful and unsuccessful groups, we examined response pairs. Chi square analysis indicated that successful groups and unsuccessful groups differed in their production of pair types (Engage & Engage, Engage & Non-Engage, or Non-Engage & Non-Engage), (*Chi sq*. (2) = 24.9, p = .000). An independent t-test indicated that the successful groups (M (7) = 3.47% (±6.05%)) produced a trend toward a significantly lower proportion of Non-Engage & Non-Engage response pairs than unsuccessful groups (M (4) = 30.46% (±35.31%)), (t(1) = 4.215, p = .07). The differences between the two other possible response pairs were not significant. Thus, these results suggest that one characteristic of the interactions of unsuccessful groups includes a lack of responsiveness or reciprocity. Again, it is worth noting the magnitude of the difference in this lack of give and take between unsuccessful and successful groups. As shown by the percentages above, the proportion of Non-Engage response pairs produced by unsuccessful groups was nearly 10 times greater than the proportion produced by successful groups.

Mastery and Transfer Performance

Independent t-tests revealed that students in successful groups performed significantly better than their peers in unsuccessful groups on both the mastery test ($M_{successful}$ (7) = 96.8% (±14.6%), $M_{unsuccessful}$ (4) = 68.1% (±32.2%), t = -3.53, p = 0.0013, df = 31) and the transfer test ($M_{successful}$ (7) = 93.6% (±16.3%), $M_{unsuccessful}$ (4) = 73.7% (±32.9%), t = -2.34, p = 0.026, df = 31). Thus, we can see that students in successful groups showed more Engaged responses as well as greater performance.

CONCLUSION

These results suggest that better collaboration, as measured by the production and acceptance of correct proposals, is associated with group performance and greater individual learning. To advance research on CSCL issues we need to continue to define features of interaction that are linked to qualities of mutual engagement, quality of joint work, and individual learning. This work is a step in that direction.

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