Title
Redfining collaboration to make it work in classrooms

Journal
Proceedings of the Annual Meeting of the Cognitive Science Society, 25(25)

ISSN
1069-7977

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Publication Date
2003

Peer reviewed

Redefining collaboration to make it work in classrooms

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This symposium tries to bridge the newly emerging learning sciences with the cognitive sciences, by focusing on the definitions of collaboration and collaborative learning. It also raises the possibility of a need for a new science. In the last 20 years, cognitive studies on collaboration have yielded results that have important implications for raising the quality of learning in real classrooms. Studies on classroom learning have in turn taught us about processes involved in classroom learning that are more complex and sustained than what has been observed and studied in experimental settings. This trend of mutual stimulation between basic cognitive studies and their real world implementation has recently evolved into the birth of the International Society of the Learning Sciences. This symposium is for the purpose of beginning a dialogue between those who are studying collaboration and collaborative learning in educational situations and other cognitive scientists studying collaboration in other complex situations.

There will be four speakers in this symposium, each representing cutting edge work on basic collaboration research and its implementation in classrooms. Naomi Miyake and Hajime Shirouzu will contrast two different views of collaboration, the convergence oriented view and the divergence integration view, and show the promise of implementing the latter into undergraduate cognitive science courses. Marcia Linn and Jim Slotta will propose a new systematic description of the nature of collaboration based on their successful practices with their highly established science curriculum WISE. The program is an example of the successful combination of normative studies of science and various forms of collaborative activities in classrooms. Janet Kolodner will present an expanded redefinition of collaboration that views collaboration and collaborative learning not just as a set of activity structures but as a value to be fostered. In Learning by Design classrooms where this value is instilled, middle school students learn not only science content but also engage in collaboration and collaborative learning as scientific communities do. Marlene Scardamalia and Carl Bereiter will argue for the need to go beyond the traditional concept of collaboration, and suggest that a new science of knowledge building may be needed to directly address issues of education in a knowledge age. Jim Greeno, our discussant, will discuss new directions suggested by these presentations and newly formed associations.

Learning through collaboration with diversity: Implementing constructive interaction in undergraduate cognitive science classrooms

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Detailed process analyses of collaborative problem solving reveal that each individual participant works constructively to deepen his or her own understanding. This potentially increases the diversity of solutions from which the participants gain different perspectives to help them generalize their solutions (Miyake, 1986; Shirouzu, Miyake & Masukawa, 2002). This divergence-oriented view differs from more commonly accepted views of collaboration, which claim that the participants generally work toward convergent solutions (e.g., Roschelle, 1992). While the convergence-oriented view implies some normative learning, it does not explain what could happen after reaching the norm, and how learning could be extended beyond the convergence. The divergence-oriented view suggests that putting the students in constructively interactive sessions can strengthen each individual student's understanding of the materials. In this view, some discrepancies remain in understanding among participants, implying that there is no end-point for comprehension. It also implies that the discrepancies elicited through the productive interaction potentially generate further learning opportunities.

We designed constructively interactive curricula and tested them with undergraduate college students in introductory cognitive science courses with some positive results. This study has shown that the divergence-oriented view is not intuitively natural for most students. They have to learn to take advantage of it. We will present a full two-year course of undergraduate cognitive science to help students gain a basic understanding of the field as well as the meta-cognitive strategy of utilizing collaborative situations for learning.

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Frameworks for collaboration and the Web-based Inquiry Science Environment (WISE)

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To understand the benefits of collaboration in complex science learning, we have developed a taxonomy of features that impact the outcomes.

Our prior research with the CLP (Computers as Learning Partners) and WISE (Web-based Inquiry Science Environment) projects has begun to sort out the decisions made by designers of collaborative environments. We connect these decisions to research on collaboration in science, mathematics, and other disciplines. We organize the taxonomy by the decisions available to designers including: participants [How many people are involved? How are they selected? Do individuals differ in expertise? Are participants acquainted?]; resources [Are there seed comments, documents, or background instruction? Are materials contested, searchable, or annotated?]; activity structures [Are contributions required, topic specific, categorized? Do participants make contributions prior to reading those of others? Do individuals offer opinions, warrants, ideas, or results?]; scaffolds [What software supports guide collaboration?]; and assessments [What feedback do participants get? How do instructors evaluate participants?]. We will illustrate the framework by describing several features of collaborative environments, the associated theoretical justifications, and the research contrasting alternative implementations of these features.

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Collaborative Learning as a Culture: What is a collaborative culture, and how can one be put into place in a middle-school classroom?

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The common notion of collaborative learning is that students work together in groups to achieve some goal. We argue that this definition of collaborative learning is deficient, that substantial learning happens when students not only work together in groups but also work within a classroom culture that values learning from each other -- one that models the essentials of a scientific culture. In such a culture, members seek each other out for advice, critique, and expertise, make themselves available to each other as needed, and sincerely enjoy (and celebrate) creating new understandings together. A major goal in such a community is to raise the capabilities and level of understanding of the collaborative in conjunction with achieving individual learning. Necessary in such a classroom culture is that the teacher takes on some new roles – sometimes acting as an authority, but also modeling and coaching and learning along with students. Our Learning by Design research project has been designing ways of creating such a culture in the classroom -- taking into account cognitive and socio-cognitive needs in creating that culture and the need for both students and the teacher to acclimate themselves to their changing roles.

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Does the Knowledge Age Need a New Science?

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The ability to generate new knowledge is coming to be seen as a major determinant of the health and wealth of nations (Romer, 1993). The distinction between extant and new knowledge is becoming increasingly important to knowledge-age considerations. The distinction between learning and knowledge building captures this important difference. Learning is a process through which a person’s beliefs, attitudes, or skills change and grow. It encompasses all those means by which our cultural heritage is passed from one generation to the next. Knowledge building, in contrast, involves the creation of new knowledge that expands the cultural capital, at least of the group that produces it. On a similar basis, collaborative learning can be distinguished from collaborative knowledge building. Although the two processes have many similar characteristics, they also have important differences related to their differing objectives. A scientific basis for collaborative knowledge building needs to draw not only on the learning and cognitive sciences but also on such diverse areas of inquiry as dialogue, dynamic systems, and memetics, insofar as these relate to the ability of collaborative groups to generate new knowledge. A challenge we are facing in our current research is to bring these and other strands together into a coherent theory that is applicable across the range from the imaginative fabrications of the young child to the disciplined creativity of the mature scientist or designer.

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DISCUSSANT

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