Shared Cognition

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Shared cognition occurs when two or more people intertwine their thinking processes, yielding feelings of “being on the same page” and often leading to intellectual accomplishments that “belong to us.” In some settings, such as when a mother and child playfully plan a tea party, shared cognition may appear to occur naturally and effortlessly. Indeed, the basic mechanisms underlying shared cognition are readily available to school-age children and adults. Yet in many situations, shared cognition does not easily occur. Partners can bring very different life experiences, assumptions, and knowledge to their joint efforts, creating the need for strategies that can bridge their unique perspectives. Shared cognition, then, is an achievement realized in a designed environment through intentional and skillful interaction.

Both formal and informal learning settings can encourage the development of shared cognition, and doing so can have benefits both for individual learning and for students’ future life opportunities. Research has shown that collaborative approaches to learning are beneficial for individual and collective knowledge growth, including the development of disciplinary practices. Studies also indicate that collaborative approaches can help students develop positive affective qualities, such as confidence and motivation. Teachers can support the expression and development of collaborative capacities through the careful design of activities, assessments, and methods for establishing and maintaining classroom norms that support productive joint work.

TRADITIONAL AND KNOWLEDGE WORK PERSPECTIVES

Traditional perspectives on learning view collaboration instrumentally. For example, a teacher may ask students to work together, but only count their individual test results toward their grade. Alternatively, a knowledge work perspective can lead to seeing collaborative learning as valuable in itself, because collaborative learning reproduces a desirable cultural practice of sharing cognition. For example, Science for All Americans, Project 2061 (American Association for the Advancement of Science, 1989) argues:

The collaborative nature of scientific and technological work should be strongly reinforced by frequent group activity in the classroom. Scientists and engineers work mostly in groups and less often as isolated investigators. Similarly, students should gain experiences sharing responsibility for learning with each other. In the process of coming to understandings, students in a group must frequently inform each other about procedures and meanings, argue over findings, and assess how the task is progressing. In the context of team responsibility, feedback and communication become more realistic and have a character very different from the usual individualistic textbook-homework-recitation approach. (p. 202)

THE SCOPE OF SHARED COGNITION

Shared cognition is one of several overlapping concepts: Intersubjectivity, social cognition, collective cognition, distributed cognition, group cognition, team cognition, collective consciousness, communities of practice, grounding processes in conversations, and transactive memory are all foci of research on how people learn together. To give a sense of the possible scope of shared cognition, we briefly review two
concepts, intersubjectivity & joint problem solving, that are closely related to the notion of shared cognition, and the somewhat contrasting perspective of distributed cognition.

**Intersubjectivity.** Intersubjectivity refers to shared understanding of what has been happening and what is going to happen next. The concept of intersubjectivity has also been central in studies of infant-parent interaction. Some definitions of intersubjectivity build on a sharing metaphor, highlighting overlap and coming to consensus. Other definitions focus on the dynamics of mutual engagement and pay equal attention to disagreement, diversity of views, and conflict (Matusov, 1996). In this view coordination of perspectives is emphasized and intersubjectivity can be achieved without agreement or complete overlap of perspectives.

**Joint Problem Solving.** Problem solving emerged in cognitive psychology as the signature cognitive activity. When solving problems together, people often find the need to share goals, ideas, plans, explanations, justifications, judgments, and many other aspects of intellectual life. For example, students can develop shared understanding of an “if-then” problem-solving rule (e.g., if the slope is steeper, the rate is faster) by spreading the parts across utterances (“Look, it's steeper!” “So, we know it's going faster.”) A distinction is made between cooperation or coordination, in which partners merely agree on breakdown of work, and true collaboration, in which partners help each other think the problem through (Teasley & Roschelle, 1993).

**Distributed Cognition.** Distributed cognition expands the unit of analyses beyond interacting partners to include the cognitive affordances of multiple partners, tools, and representations. A well-known example comes from Ed Hutchins (1995) who analyzed the navigation of a ship coming into harbor and showed that successful navigation of the ship was dependent on complex coordinations between the knowledge of team members, measurement tools, and representational systems. Based on this and other analyses he argued that human intelligent action is productively conceived as an accomplishment that arises from properties of interactions between people or between people and artifacts in the world.

**BUILDING BLOCKS OF SHARED COGNITION**

Close analyses of conversations have led to deeper understanding of building blocks that support the accomplishment of shared cognition. Four building blocks are discussed below.

**Joint Attention.** Joint attention is first observed between 9 and 15 months (Adamson & Bakeman, 1991). Studies of infant-mother interaction provide interesting insights about the subtle ways in which partners help regulate the attention of the other and highlight how both partners are active contributors to the process. Achieving joint attention during problem-solving situations depends on the mutual intent of group members to share a focus and come to a common understanding.

**Making and Acknowledging Contributions.** Participants build a sense of shared cognition through interactions that make and acknowledge contributions (Clark, 1996). Participants take knowledge to be shared only after a first participant's bid to introduce an idea is accepted by a second participant. This can occur in two short utterances or be the result of a lengthy deliberation.

**Grounding.** The everyday phrase “finding common ground” is a practical solution to a pervasive problem in sharing cognition: How can participants tell if an idea is mutually understood? A simple “uh, huh” provides weaker evidence than a more elaborate paraphrase that participants agree on. Common ground can also be found in action; smooth translation of ideas to satisfactory joint actions is good evidence the ideas were shared. Conversational analysis shows that people flexibly apply a variety of grounding strategies and criteria of mutuality depending on the purposes of communication and the channels of communication available (Clark & Brennan, 1991).
**Repair.** Of course, attempts to share cognition often go astray. Successful collaborators notice divergence and engage in repairs. For example, in baking a cake one might have the following exchange: “The recipe called for 1 teaspoon of baking soda.” “No, baking powder.” “OK, I'll put in 1 teaspoon of baking powder.” In this set of three utterances, by saying no and emphasizing the word *powder* the second person repairs the misconception of the first and the two people achieve shared knowledge of the right ingredient.

Although these building blocks have been described in generic terms, one can imagine their application to classroom situations. In order to share cognition, teachers and students must also achieve joint focus of attention, make and acknowledge contributions, find common ground, and repair misunderstandings.

In one example, researchers observed students constructing a “joint problem space” (Roschelle, 1992; Teasley & Roschelle, 1993). A joint problem-solving space was defined as a shared conceptual structure developed in the course of collaborative work. In a study of two girls using a computer simulation designed to provide a dynamic view of velocity and acceleration, Roschelle (1992) argued that the creation of a joint problem-solving space was accomplished through repeated cycles of displaying, confirming, and repairing understandings. As the conversation progressed, the students expected increasingly explicit evidence that they understood one another.

### HOW SHARED COGNITION CONTRIBUTES TO LEARNING

Theorists have given varied accounts of how shared cognition leads to learning. More recently, researchers have developed more specific accounts and analyses.

Conflict was central in the theory of Jean Piaget (1896–1980) about how social exchange can result in cognitive development (Piaget, 1932). Different perspectives on the same problem can lead to disagreements, de-centering from one's own perspective, more advanced stages of cognitive development, and sometimes mutual understanding.

Interaction within a *zone of proximal development* was central to the theory of development put forward by Lev Vygotsky (1896–1954) (Vygotsky, 1978). This zone represents the level of challenge at which a learner cannot independently accomplish a task but can do so with the help of a more expert peer or teacher. *Internalization* occurs because the child is actively playing a role in the joint activity and the more expert partner is attending to when and where assistance is needed. The child comes to own not only skills but the cultural tools that have been developed over long periods of time, such as writing systems, maps, language, and numerical systems.

More recently, investigators have offered more detailed explanations of how group work can support individual learning. These include opportunities to share original insights (Bos, 1937), resolve differing perspectives through argument (Amigues, 1988; Phelps & Damon, 1989), explain one's thinking about a phenomenon (King, 1990; Webb, Troper, & Fall, 1995), provide critique (Bos, 1937), observe the strategies of others (Azmitia, 1988), listen to explanations (Coleman, 1988; Hatano & Igarashi, 1991), and generate new insights through shared abstract representations, such as diagrams (Jeong & Chi, 2007; Schwartz, 1995).

Increasingly it is recognized that asking learners to work in groups does not automatically lead to interactions that capitalize on the knowledge and skills of all group members. One of the most challenging aspects of group projects involves developing an understanding of what knowledge is shared and what knowledge members hold uniquely. The extent to which learners come to a common or shared understanding of their efforts can vary, depending on multiple factors including their prior experiences, their personal relationships, broader power structures in society, and the extent to which their goals for the task are aligned.
Research that attends explicitly to variability in group interaction has provided information about how relational challenges can interfere with the shared cognition, even when collaborators have similar levels of prior knowledge. Barron (2003) analyzed the interactions of 16 triads in order to understand the sources of variability in how well the students collaborated and how much individuals learned. She found less joint attention in groups in which partners were competing, and this translated into poorer performance even when correct solutions were voiced. If a collaboration is going well: (1) many students will be involved in the discussion as contributors and responders, (2) the contributions are coordinated rather than consisting of many independent, unrelated conversational turns; (3) students attend to one another and to their work in common as indicated by eye gaze and body position. These are good markers of mutual engagement and joint attention, important elements of collaborative work.

SCHOOLING PRACTICES

A great deal of work has been done to specify the kinds of tasks, accountability structures, and roles that help students collaborate well. It is generally agreed that tasks requiring interdependence of team members, accountability structures at the group and individual level, and opportunities to reflect on group progress and interaction are key elements. Two approaches, complex instruction and jigsaw, are described below.

Complex Instruction. Cohen and her colleagues developed Complex Instruction, one of the best-known and well-researched approaches. Complex Instruction uses carefully designed activities that require a diversity of talents and interdependence among group members. Teachers are encouraged to pay attention to unequal participation that often results from status differences among peers and are given strategies that will allow them to bolster the status of infrequent contributors (Cohen & Lotan, 1997). In addition, roles are assigned that support equal participation. The roles include a recorder, a reporter, a materials manager, a resource manager, a communication facilitator, and a harmonizer. A major aspect of the approach is the development of “group-worthy tasks” that are both sufficiently open-ended and multi-faceted in their cognitive demands to require and benefit from the participation of every member of the group.

Jigsaw Method. The jigsaw method divides topics among students so that each class member becomes an expert in a subtopic. Experts then teach their group members what they know so that the group benefits from the distributed work. For example, groups of four to five students might be asked to write proposals to study a specific animal species (Engle & Conant, 2002). The groups are then assigned an animal based on the quality of their group proposal. A final product of the group is required, such as a written report to which all members of the group contribute. Individual students become expert on a specific subtopic, such as reproduction strategies or defense mechanisms, and contribute chapters that focus on these subtopics. After they have shared this knowledge with their group, the entire group writes the introduction and conclusion.

IMPLICATIONS

Education traditionally downplays the importance of shared cognition in favor of sequestered test-taking skills. This bias appears shortsighted in an era driven by the intellectual accomplishments of teams. By understanding the building blocks of shared cognition, the ways in which shared cognition can enhance learning, and research-based school practices, educators can enable students to learn both subject matter content and how to succeed in realistic adult tasks.

BIBLIOGRAPHY


