Situative Cognition

James G. Greeno

Timothy J. Nokes-Malach

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UNIVERSITY OF PITTSBURGH
LRDC Learning Research & Development Center

LearnLab
Pittsburgh Science of Learning Center

Autobiographically

- A problem I've worked on consistently (for over 50 years, now): Can we explain, with a theory, the difference between knowing procedurally (how to get an answer) and understanding conceptually what the problem is about?

- The field that includes this problem has changed its methods and concepts over the years, including changing its name. So, although I have worked on a single problem for half a century, what I've done has been labeled differently from one decade to the next:
  = when I graduated, I was an experimental psychologist
  = by the time I was a professor, I was a cognitive, and mathematical, psychologist
  = in another decade, I was a cognitive scientist
  = and now, I'm a **learning scientist**

Timothy J. Nokes-Malach

Autobiographically

- My research examines human learning and problem solving with an aim to understand, predict, and promote knowledge transfer
- Ph.D. Cognitive Psychology, University of Illinois at Chicago
- Beckman Postdoctoral Fellow, University of Illinois at Champaign-Urbana
- Associate Professor of Psychology, University of Pittsburgh Research Scientist at the LRDC

A small issue of terminology

- As we understand it, situated cognition and learning is not a topic; it's a general assumption
  (We believe that it's preferable to assume that cognition and learning are always inherently situated — not that some cognition and learning are situated, and some aren't, or that in some cases, cognition or learning is situated more, or less, than in other cases)

- Therefore, we prefer the term ***situative*** (as in situative framework, situative theory, situative perspective) rather than *situated* (as in situated cognition, situated learning, situated action) because *situative* is less likely to invite the misconception that some cognition (or learning or action) is situated and some isn't

Three bits of history

- J. Lave’s talk (Dec. ‘84? Jan. ‘85?) reported findings in ethnographic studies of grocery shopping and young Brazilian street merchants — The problem space, including what constituted a solution, ***emerged dynamically***, contradicting the basic cognitivist assumption of a stable problem space in which to search for a solution (see Lave, Murtaugh, & de la Rocha, 1984)
- L. Suchman’s 1985 book, *Plans and Situated Action*, challenged the assumptions of AI planning and plan recognition in principle, arguing that HCI is inherently asymmetric
- IRL was founded in 1987, expecting to focus on developing software for apprenticeship learning, but a review of studies of apprenticeship (Lave & Wenger, 1991) indicated that legitimate peripheral participation (LPP), not apprenticeship per se, was an important aspect of social arrangements for learning

Overview

- Part 1: Motivation, assumptions, and definitions
- Part 2: Framework

  → *Discussion activity 1*
- Part 3: Explanation patterns

  → *Discussion activity 2*
- Part 4: Some future directions

  → *Discussion activity 3*

Part 1: Motivation and assumptions

- Jim's interests in a situative perspective captured by the autobiographical comments and three bits of history
- Tim's interests in a situative perspective stem from trying to understand transfer in classroom contexts; interactions with stuff in the world; how motivation emerges in a classroom
- We view this perspective as core to the learning sciences and one of the things that separates it from experimental psychology

Example: Engle and colleagues

- Studied the interaction of fifth-grade students and their teachers in classroom activities developed in the Fostering Communities of Learners (FCL) project (Brown & Campione, 1994)
- "Big Old Argument" about how orcas should be classified (Engle & Conant, 2002) and focused on what students learned and transferred about causal explanations for why various animal species were endangered (Engle, 2006)
- **Approach**: 1) What content was constructed in common ground of the learning interactions and 2) How did individuals participate in that content?

Example: Engle and colleagues

- Engle and Conant (2002) hypothesized that the conditions for productive disciplinary engagement included:
  - Being positioned with authority and accountability in a practice

- One way to support this is through the teacher's framing of instruction (Engle, 2006)
  - Expansive framing – time, people, and places

Definitions

- **Activity system**: higher level learning system, unit of analysis is larger than the individual person – either two or more people, or an individual working with objects or technological systems (e.g., classroom, small group interaction; tasks)

- **Community of practice**: people who know how to participate in regular reoccurring practices of an activity system and trajectories of participation (Wenger called this identity) (e.g., authority and accountable)

- **Framing**: *"What is going on here?"* (Goffman, 1974) (e.g., expansive versus bounded)

- **Affordances**: qualities of systems that can support interactions and there present possible interactions for an individual to participate in (Greeno & MMAP, 1998; building on Gibson, 1986) (e.g., accountability and authority → ok to express opinions)

Definitions cont.

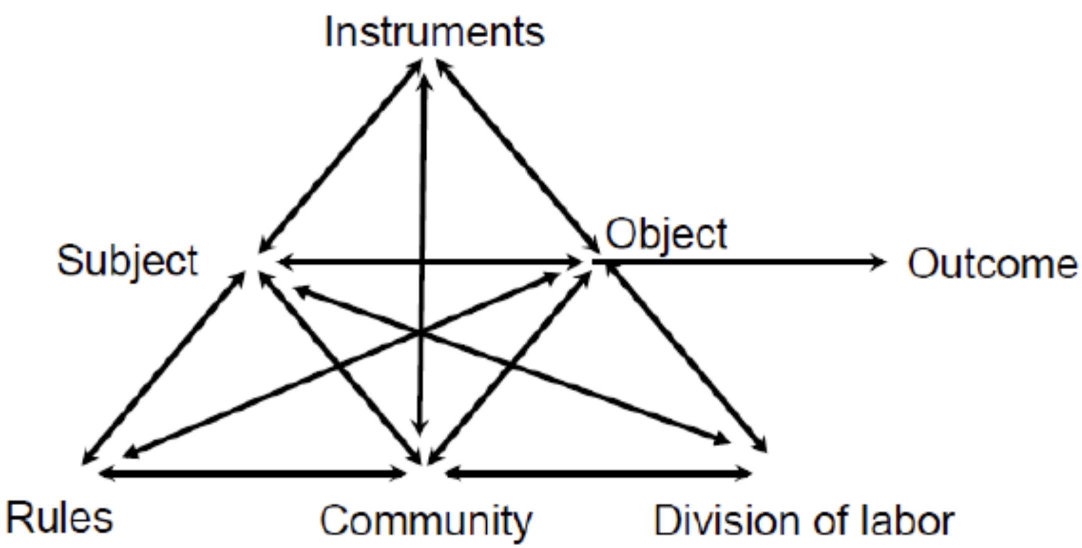
- **Constraints**: if-then regularities of interactions with material and informational systems that enable a person to anticipate outcomes and participate in trajectories of interactions (Barwise & Perry, 1983)
(e.g., accountability → can't give just any opinion)

- **Information structures**: patterns of information;
mental representation
(e.g., problem space; is it conceptual or procedural?)

- **Participation structures**: patterns of interaction in which several of the components of systems coordinate their behaviors as they participate in their joint activity
(e.g., differences in competence, authority, and autonomy)

Part 2: Framework

- **<u>Subject or agent</u>**: can be an individual or a group
- **<u>Object</u>**: what the subject works on
- **<u>Instrument or resources</u>**: the subject uses in an effort to transform the object according to the goal



Engestrom, 1987, p. 78

Discussion activity 1

How do (could) these concepts get applied in your research?

Part 3: Explanation patterns

About levels

- We claim that analyses at the individual-cognitive level, and at the activity-system level are both valuable
  We agree with Stahl (2014) who wrote:
  "Group cognition is not a physical thing, a mental state, or a characteristic of all groups. It is a unit of analysis" [p. 2]

- And with Goldstone & Gureckis (2009):
  "Indeed, one might go so far as to say that groups of people can be interpreted as information processing systems" [p. 415]

- Studies focused on either level that advance understanding of cognition or learning are valuable contributions to the learning sciences

- Even so, we also value efforts to integrate concepts and findings between the levels
  (see Mitchell, 2003, on "integrative pluralism")

Some examples of integrative contributions

A. In some studies, a phenomenon is explained with a mixture of aspects of interaction, some at the level of individual cognition and others at the level of cognition by an activity system

A1. Engle (2006) on transfer
Framing: epistemological and positioning

A2. van de Sande & Greeno, 2012
Reaching alignment with positioning and frame recognition

A3. Greeno, Sommerfeld & Wiebe in Stenning et al.
Reframing or not, with positioning and a (cognitive) explanation of an alternative

Some examples of integrative contributions

B. A phenomenon at one level is explained with a hypothesis about a process at the other level, that is

= a phenomenon of activity-system cognition or learning explained by hypotheses about individual cognition or learning

individual-level hypothesis (ILH) → **system-level phenomenon** (SLP)

= a phenomenon of individual-level cognition or learning explained by hypotheses about system-level cognition or learning

system-level hypothesis (SLH) → **individual-level phenomenon** (ILP)

Some examples of integrative contributions

B1. ***ILH → SLP;*** Hutchins & Klausen (1998)

Individuals in an airplane crew had different knowledge that they combined to construct a case to support their request to change their altitude

B2. ***SLH → ILP;*** Moss & Case, 1999; Bowers, Cobb & McClain,1999

Many studies are like these. A program of instruction is designed and conducted in (a) classroom(s), students are assessed individually, and findings are interpreted as results of their participation in the classroom activities

Discussion activity 2

1. Think about learning environments as activity systems
   1a. In a traditional class, with a teacher and a group of students, what (or who) are the main system components (subject, object, and resources)?
   1b. How is this different if the learning activity is interacting with a computer program?

2a. Given that classroom learning occurs in an activity system, is it ok (for research?, or for practice?) to test its effects with individual assessments?

2b. What assumption(s) can we infer is(are) made for this to be coherent?

Part 4: Some future directions

- Further integrating activity system explanations with individual cognitive explanations
- Analyzing classroom level motivation
- Cognitive and motivational assessments of the activity system

Discussion activity 3

What future directions are you pursuing?