

Group Cognition: the collaborative locus of agency in CSCL

Gerry Stahl

Drexel University, Philadelphia, USA

Gerry.Stahl@drexel.edu

www.cis.drexel.edu/faculty/gerry

Methods & Theory

- CSCL in the next decade faces the challenge of not only designing *educational technologies and interventions*, but of having to invent *analytic methodologies and theoretical frameworks* appropriate to the unique character of collaborative learning as an interactional group accomplishment.

Unit of Analysis

- This paper argues that thinking in CACL settings should be primarily analyzed at the *small-group unit of analysis*, where contributions coming from individual interpretive perspectives are interwoven into group cognition.

Locus of Agency

- The *collaborative discourse* is the agent of knowledge building that requires computer support and curriculum design.

Group Cognition

➤ Groups “think”!

Can Groups Think?

- Can computers think?
- Can groups think?
- Collaborative knowledge building \Leftrightarrow thinking?

the AI experience

- The AI question:
 - Can computers think?
- Three major considerations:
 - Turing test
 - Searle's Chinese room (in Taiwan?)
 - Dreyfus: computers still can not think

Turing

- In 1950, Turing asked, “Can machines think?”
- His paper defined much of what the field of AI has tried to do for 50 years.
- He defined the “Turing test” to measure if computers could be said to think.
- Can a computer answer questions like a person, so you cannot tell which is which?
- Computer (and AI) failed the test.

Turing

- Suppose you posed questions to a small group and to an individual person online.
- Could you tell which was not a person?
- (a) The group could just elect an individual to answer.
- (b) The content of a monologue and a group response can be identical if only text is seen and the group tries to respond as one.

Searle

- Searle did a “thought experiment” to see if computers think when they answer questions using AI techniques.
- He imagined himself doing the processing in a computer responding to Chinese.
- He could answer the questions correctly without understanding Chinese or the questions by following algorithms in English.
- This would not be “thinking” because he would not understand what the questions were about.

Searle

- If a group answers questions, is the group thinking?
- If Searle were in the group, participating in the answering, he would understand.
- If the answers were by the group as a whole, he would say that he understood the answers and that the group understood them.

Dreyfus

- Dreyfus argues that AI does not capture the way that people act, understand and think.
- He draws on the analysis of human Being-in-the-world of Heidegger & Merleau-Ponty.
- AI retrieval from large info sources does not scale like human retrieval; more is not better.
- AI cannot represent skills and expertise.
- AI cannot determine relevance like an expert.

Dreyfus

- A group does act, understand & think like individual people.
- It can retrieve better info if it knows more.
- It can act skillfully with expertise.
- A group can determine what is relevant.
- A group performs cognitive tasks in much the same way that individuals do.

comparison

	Can computers think?	Can groups think?
Turing test	NO	YES
Intentionality thought experiment	NO	YES
Phenomenological analysis	NO	YES

➤ So, what are the implications of the discovery of group cognition for the agenda of CSCL in the next 10 years?

CSCL Agenda

- A time for reflection on the past & next 10 years.
- Who are “we”: the global CSCL community?
- A community of individual researchers, teams, projects, inter-national & multidisciplinary collaborations, regional networks, a global set of conferences, books, journals,
- Personal agendas parallel, intertwine, follow and lead the larger, collaborative, historical agendas of the disciplines.

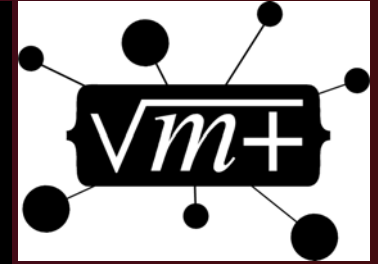
My agenda

- My personal CSCL research history for the past several years:
 - need for theory to clarify concepts of collaboration (CSCL 2002)
 - meaning is a shared group phenomenon, interpreted by individuals (CSCL 2003)
 - need to focus on small-group unit of analysis (Kaleidoscope 2004)
 - Group cognition (book & CSCL 2005)

Our agenda at Drexel

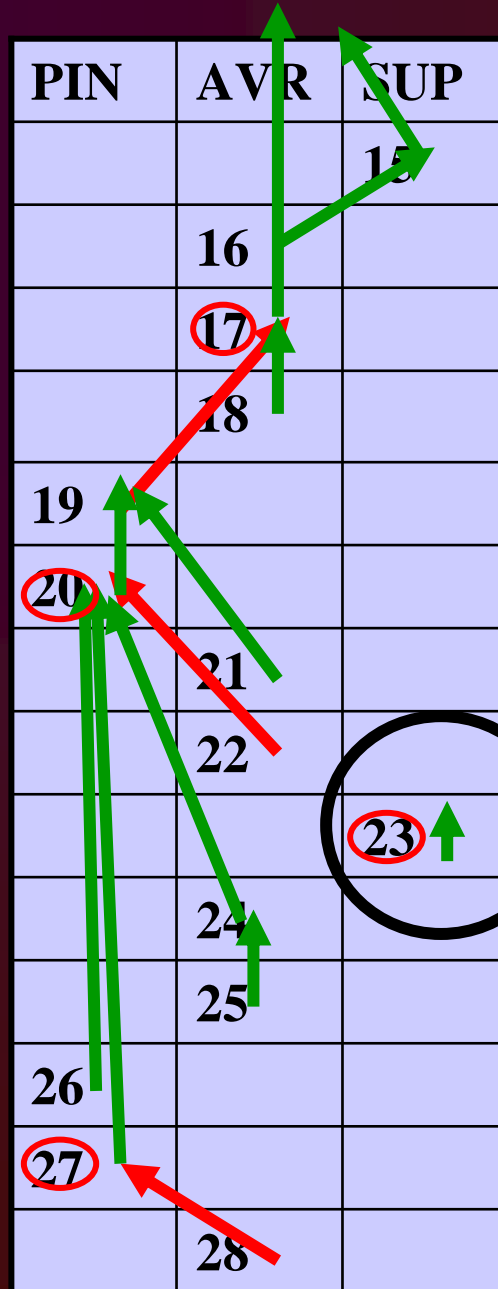
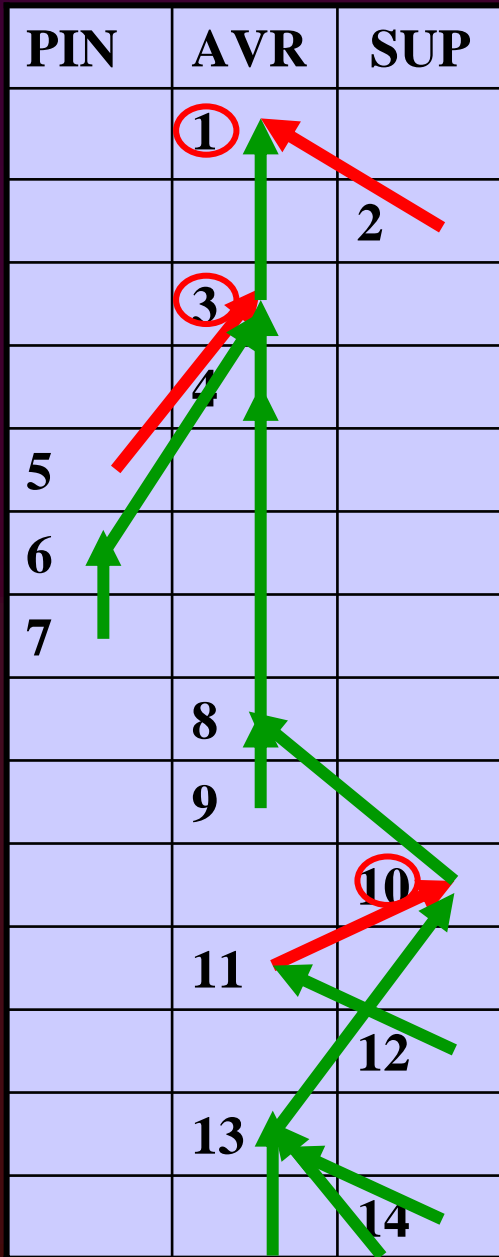
- Inquiry into how to foster & support group cognition involving computers.
- Identify episodes of computer-supported group cognition.
- Analyze methods online groups use to accomplish cognitive tasks collaboratively.
- Document the potential and barriers to more effective group cognition.


Virtual Math Teams



- Year 2/5 of project with mathforum.org.
- Invite small groups of students to chat room to collaboratively discuss interesting mathematics.
- Automatically collect almost all aspects of interactions.
- Analyze chat logs with Conversation Analysis, multi-D coding, ethnography.
- Develop software, service, math problems, mentoring, community building, etc.

- 1. Avr (21:46): **Okay, I think we should start with the formula for the area of a triangle**
- 2. Sup (22:17): ok
- 3. Avr (22:28): **A = 1/2bh**
- 4. Avr (22:31): I believe
- 5. pin (22:35): yes
- 6. pin (22:37): i concue
- 7. pin (22:39): concur*
- 8. Avr (22:42): **then find the area of each triangle**
- 9. Avr (22:54): oh, wait
- 10. Sup (23:03): **the base and heigth are 9 and 12 right?**
- 11. Avr (23:11): no
- 12. Sup (23:16): o
- 13. Avr (23:16): that's two separate triangles
- 14. Sup (23:19): ooo
- 15. Sup (23:20): ok
- 16. Avr (23:21): right
- 17. Avr (23:27): **i think we have to figure out the height by ourselves**
- 18. Avr (23:29): if possible
- 19. pin (24:05): i know how
- 20. pin (24:09): **draw the altitude'**
- 21. Avr (24:09): how?
- 22. Avr (24:15): right
- 23. Sup (24:19): **proportions?**
- 24. Avr (24:19): this is frustrating
- 25. Avr (24:22): I don't have enough paper
- 26. pin (24:43): i think i got it
- 27. pin (24:54): **its a 30/60/90 triangle**
- 28. Avr (25:06): I see



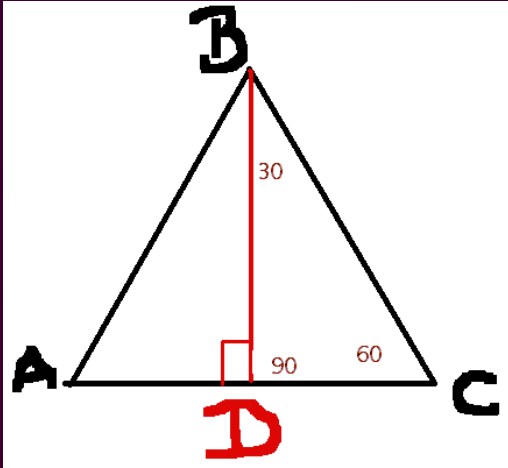
adjacency pair


other uptake


intersubjective
 small-group
 meaning
 making

sequentiality
 of doing math

- The unit of analysis is the math proposal/response pair.
- It incorporates both *uptake* (Suthers) and *inter-animation* (Wegerif) of personal interpretive perspectives in the collaborative building of shared meaning or group cognition.



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- Math chats proceed through “math proposal adjacency pairs”
- Line 23 was a “failed proposal”
- Close analysis shows by contrast what goes into intuitively constructing an effective proposal
- *Group Cognition*, chapter 21
- EARLI 2005, CRIWG 2005, ICCE 2005

Sequential analysis of chat logs

- *Ethnomethodological* – understanding how people interact in complex ways that are taken-for-granted
- Analogous to *Conversation Analysis* – talk-in-interaction constructs sequential meaning following patterns of turn taking, repair, negotiation, group constitution, etc.
- *Face-to-face conversation* uses gesture, gaze, pause,
- *Online chat* imposes different constraints and possibilities: parallel threads, simultaneous contributions, persistent text, relative anonymity, software supports (awareness, whiteboard, computer & Internet environment,)
- What are the *methods people systematically* use to converse in *chat*? To *solve problems* together? To *do math* collaboratively?

Design-based research

- Built on Problems of the Week at mathforum.org solved individually.
- Open invitation to “powwows” using popular [AOL Instant Messenger](#).
- Solicited through teachers for new math worlds using ConcertChat with whiteboard.
- Developing software further iteratively; also math, pedagogy, service, motivations, etc.

Case studies

- Evidence of collaborative learning is in *brief episodes of shared meaning making*, not in long-term cognitive changes in individual minds.
- Interaction episodes are highly unique and incomparable – but they illustrate *general methods* that people use (within a given culture) to accomplish common actions.
- *Breakdowns*, failures, barriers, breaches make explicit what is usually tacit, and makes it visible for analysis.
- Case studies allow researchers to *understand* what takes place in interaction.

Interaction analysis

- Individual utterances only *make sense* within their context – must be analyzed at *group cognition unit*.
- Interpretations by different people, using different perspectives reveals complex, overlapping relationships among words, gestures, etc.
- Close study of brief interactions reveals common, taken-for-granted patterns or “member methods”.
- How groups constitute & structure themselves.
- Systematics of methods groups use for doing math through online interaction.

Group cognition

- Group cognition is not a sum of individual thinking, but displays its own sequentiality, accountability & intentionality.
- As the locus of agency of collaborative knowledge building, group cognition provides the foundation for CSCL.
- We need to find ways to overcome barriers (group think, failed proposals, power relations) to surpass individual cognition.
- Analysis of group cognition will guide design of technologies to foster it and support it.

CSCL methods

<i>Stereotypical paradigm</i>	<i>CSCL next 10 years</i>
Experimental design	Design-based research of technological mediation
Effects of controlled variables	Case studies of group methods, social context
Outcome measurements	Interaction analysis, coding patterns, ethnography
Individual cognition	Group cognition

Group Cognition
(the book) from
MIT Press in the
Spring –
prepublication
version available now:
[www.cis.drexel.edu/](http://www.cis.drexel.edu/faculty/gerry/mit)
[faculty/gerry/mit](http://www.cis.drexel.edu/faculty/gerry/mit)

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