# Group Cognition: A Foundation for the Learning Sciences

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# Focus on group interaction



- Group cognition is a theory of learning, which focuses on analysis of processes that take place at the small-group unit of analysis (i.e., in interactions, not in heads).
- It provides a theoretical foundation for the learning sciences, particularly in CSCL settings.
- It focuses on under-researched learning processes, in contrast to studies of individual and community learning.
- It is a method for analyzing learning as it takes place.
- Group cognition can be observed directly in traces of interaction, without hypothesizing mental or institutional entities.
- The Virtual Math Teams (VMT) Project offers paradigmatic cases and analyses of group cognition in CSCL.

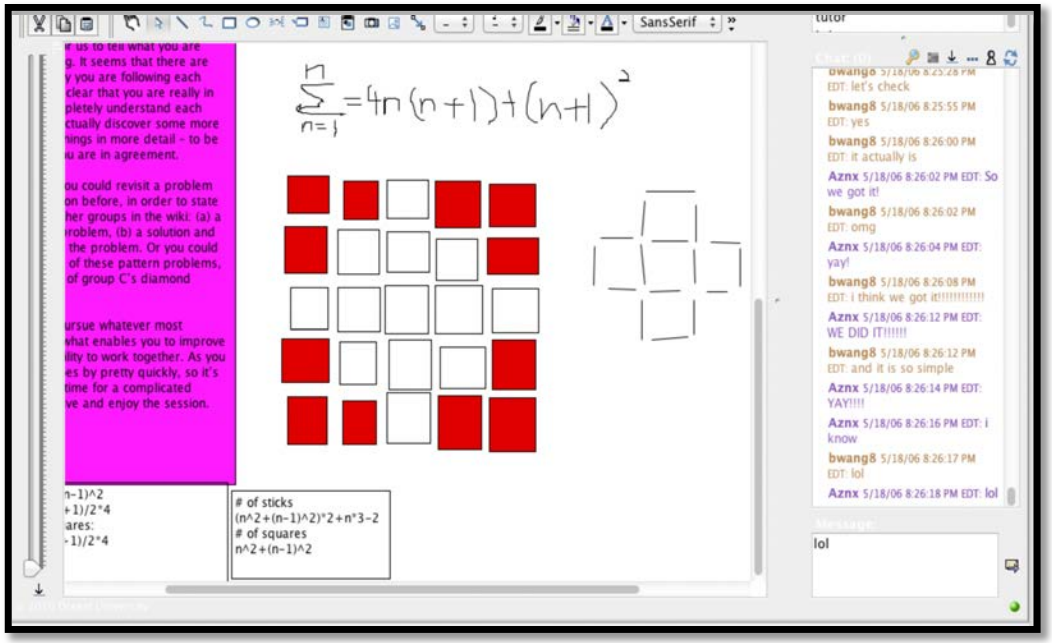
# Discussion part 1



- **I propose that it is often fruitful to analyze cognition on multiple levels and that the processes at the different levels work together. The learning sciences need methods for analyzing cognitive process at the individual, small-group and community cognitive levels.**
- **This does not mean there is some kind of "group mind" at work or anything other than the interaction of students. Rather, it means that the analysis of many cognitive achievements – particularly in CSCL settings like VMT – may be most appropriately conducted at the group unit of analysis, in terms of the interplay of the posting and drawing actions shared by the group. (p. 2)**

# Response sequences



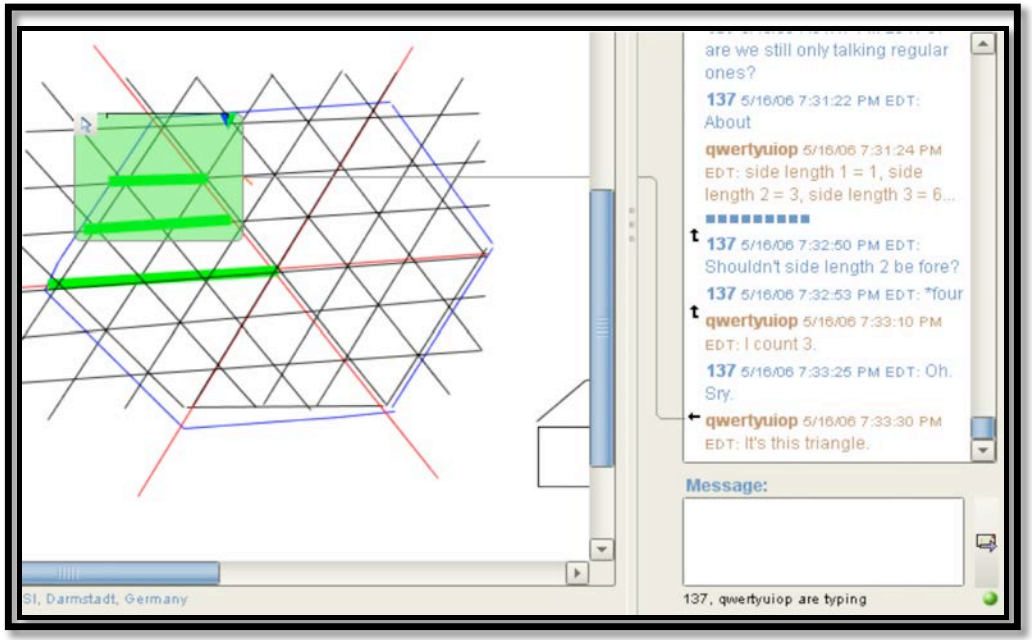



**The team of Bwang and Aznx engages in a long sequence of response pairs that forms a typical math problem-solving process.**
**Each utterance is an interactional elicitation or response. The interaction creates the group as a cognitive agent.**
**The emphasis is on the process, not on "math facts."**
**The successful process is a product of the group interaction; not reducible to any individual's mental contents.**

Move 1. Open the topic
Bwang: i think we are very close to solving the problem here
Aznx: We can solve on that topic.
Move 2. Decide to start
Bwang: well do you want to solve the problem
Aznx: Alright.
Move 3. Pick an approach
Aznx: How do you want to approach it?
Bwang: 1st level have 1*4 … 4th level have (1+3+5+7)*4
Move 4. Identify the pattern
Aznx: So it's a pattern of +2s?
Bwang: yes
Move 5. Seek the equation
Bwang: what is it
Aznx: n^2 … or (n/2)^2
Move 6. Negotiate the solution
Aznx: its n^2
Bwang: so that's wrong
Move 7. Check cases
Aznx: would be 4n^2
Bwang: it actually is
Move 8. Celebrate the solution
Bwang: i think we got it!!!!!!!!!!!!
Aznx: WE DID IT!!!!!!
Move 9. Present a formal solution
Aznx: So you're putting it in the wiki, right?
Bwang: yes
Move 10. Close
Aznx: we should keep in touch
Bwang: yeah

# Persistent co-attention



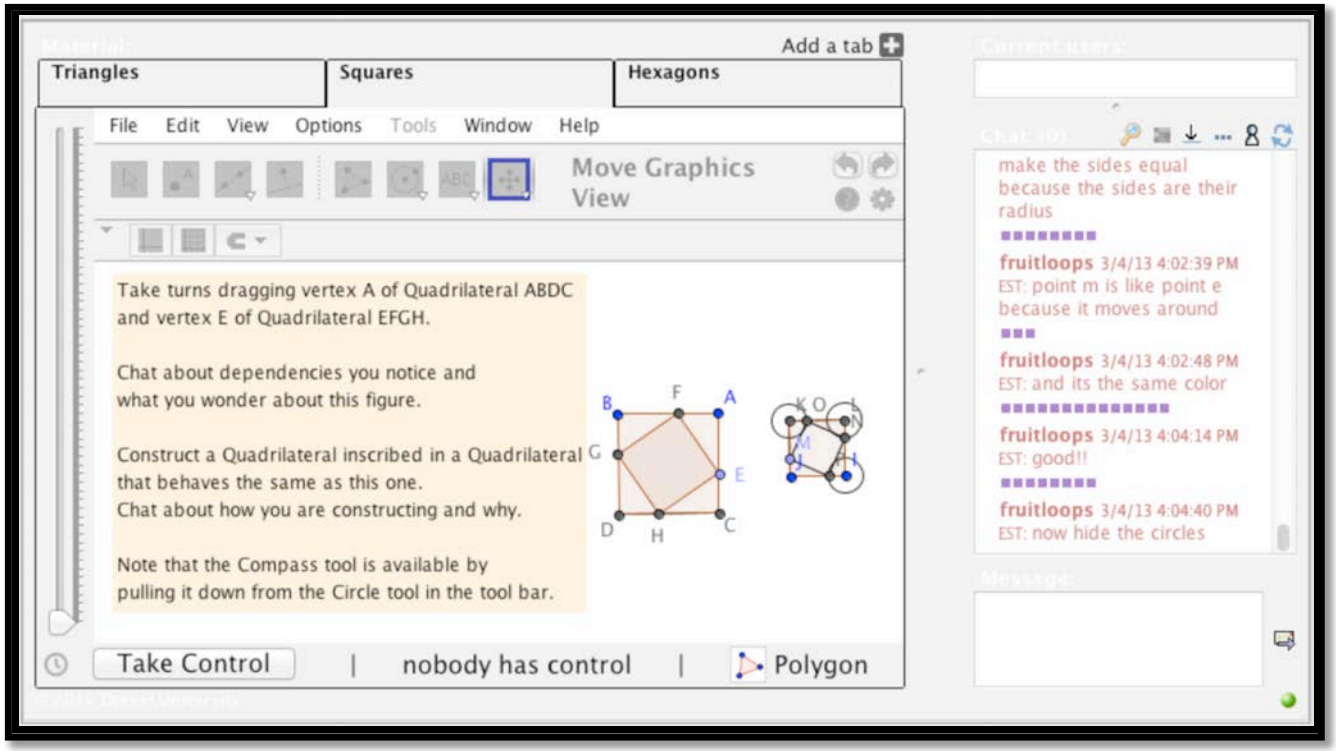



**137:** So do you want to first calculate the number of triangles in a hexagonal array?
**Qwertyuiop:** What's the shape of the array? a hexagon?
**137:** Ya.
**Qwertyuiop:** ok...
**Jason:** wait-- can someone highlight the hexagonal array on the diagram? i don't really see what you mean...
**Jason:** hmm.. okay
**Qwertyuiop:** oops
**Jason:** so it has at least 6 triangles?
**Jason:** in this, for instance

**The team of 3 students (Jason, Qwertyuiop, 137) discusses a math problem to explore. Qwertyuiop asks for clarification of Jason's proposal and then Jason halts further discussion until they all see the same thing as a shared object of joint attention.**
**137 uses several methods to coordinate visual attention: coloring lines and pointing from chat to an area of the shared whiteboard.**
**Jason checks that he now sees the same thing as the rest of the group and demonstrates his vision while also advancing the problem-related group work.**
**Thru the chat and whiteboard shared interaction, the group constitutes itself as a collaborative group with a shared problem and a joint visual attention.**

# Shared understanding






**Fruitloops, Cheerios and Cornflakes work together using text chat and dynamic geometry.
They figure out how to construct a square.
Then they use their insight from inscribed triangles to construct a square inscribed inside a square.
They demonstrate in their chat and geometry actions that they all understand the principles behind their successful group construction.**

**The team of three middle-school girls coordinates their group effort in a CSCL geometry setting, mediated by curricular resources. They enact a problem to work on and a group approach.
The chat not only coordinates their geometry actions, but shares their understanding of those actions, including the software and mathematical principles involved. For instance, they state that certain line segments they constructed are made equal by the use of equal radii of congruent circles. Also certain points in their construction correctly correspond to points in the given figure in terms of their behaviors and their representations in the software.**

# Discussion part 2



- **Following the phenomenologists, the ethnomethodologists showed that the shared social world is constituted continuously through group interaction. In our VMT data, we can study precisely how that is accomplished. We see that it takes place over longer sequences of discourse moves, each centered on elicitation/response adjacency pairs. Carrying out these longer sequences requires maintaining persistent co-attention to a shared object; the being-there-together at the object provides a shared focus for the discourse. Accompanying this, there must be a shared understanding of the object and of the discourse context so that group members understand each other. (p. 13)**

# The level of the small group



**The small group constitutes itself as an agent with projected tasks, situated needs and resources, past accomplishments.**

**The small group enacts many group practices to achieve cognitive, linguistic, emotional group accomplishments.**

**Results of small group interaction may be transformed into individual skills, memories, etc. They may also be institutionalized into community practices.**

**The individual may adopt group practices through self-talk and re-construe them in accordance with folk theories or individual psychology.**

**Self-reports gathered in surveys, questionnaires, tests, focus groups, or interviews are mediated by the reporter's preconceptions and *current* role/situation.**

**Individual linguistic abilities to *understand* and *respond* to interactions contribute to group accomplishments.**

**The community may adopt group practices through dissemination and institutionalization, under constraints from other community practices.**

**Learning at the community level can include classroom discussion of group work, interactions within communities of practice, online communities such as MOOCs or Wikipedia.**

**Social practices and human bodily practices are enacted at many levels.**

# A direct methodology



## Interaction Analysis

**In VMT studies of interaction, the analysis stays close to un-mediated traces of the original interaction.**

**The evidence is the details of the interaction, without aggregation, imposed categories, hypothesized mental constructs, etc.**

**One can see learning-related group practices taking place in the analyzed interaction. Inter-actors demonstrate their understanding and learning visibly to the group and thereby to analysts.**

**People necessarily use general practices (of human communication), so a single example can provide general results.**

## Statistical Analysis

**In a statistical analysis, the original data is invisible. It has been sorted into categories (requiring interpretation and judgment by analysts with their own goals and preconceptions).**

**The interactional sequencing and response structure is gone due to aggregation. Uniqueness of specific actions is averaged over.**

**Many assumptions of statistical representativeness and causality must be met or the whole analysis is questionable.**

**Statistically significant results are rare and they usually do not provide insight into how learning takes place.**

# Discussion part 3



- **A math problem can serve as an effective interactional resource for bridging across cognitive levels. Typically, it introduces content—definitions, elements, procedures, principles, practices, proposals, theorems, questions—from the cultural traditions of mathematics and from school curriculum. In so doing, it recalls or stimulates individual cognitive responses—memories, skills, knowledge, calculations, deductions. It is then up to the group interaction to bring these together, to organize the individual contributions as they unfold in the on-going interaction in order to achieve the goals called for by the community, institutional, disciplinary and historical sources. In this way, the group interaction may play a central role in the multi-level cognition, interpreting, enacting and integrating elements from the other levels, producing a unified cognitive result and thereby providing a model for future community practice or individual skill. (p. 3)**

# CSCL as foundational



## CSCL

**According to Vygotsky, all the higher human mental or psychological functions originate in inter-personal, small-group interactions.**

**According to Mead, individual identity is adopted from how people view each other. "We" is more fundamental than "I."**

**We learn primarily through other people and language, which is a medium of inter-personal communication.**

**CSCL studies the mediation of learning by collaboration and media (especially computational media).**

## The Learning Sciences

**The learning sciences have traditionally been dominated by theories, methods, perspectives and assumptions from psychology and education, which focus on the individual mind, with influences from the society.**

**Learning processes can be identified at the small-group, individual and community/societal levels. The small-group processes have been under-researched. Individual mental constructs have always dominated research. With Lave & Wenger's situated cognition and the role of the Internet, large community scales are now being studied. But group processes are still reduced to the individual level.**

# More on CSCL & group cognition



- **International Journal of CSCL at: www.ijCSCL.org**
- **CSCL resource page at: www.GerryStahl.net/cscl**
- **CSCL blog at: cscl-community.blogspot.com**
- **All Stahl publications available at: www.GerryStahl.net**
- **also links to Stahl channels for: YouTube, Smashbooks, Lulu, Amazon, Scholar, ….**
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