Thinking at the Small-Group unit of analysis

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Overview

- What I have begun to learn from my current research – year 1 of 5 and a book
- "Thinking at the group unit of analysis"
  - Not so much an ontological commitment to group mind
  - As a methodological focus on group discourse as a process of shared meaning-making that is productively analyzed at the group level
- For CSCL to promote knowledge building, it should understand & support with technology thinking at the group unit of analysis

How can we analyze collaborative learning?

- What are the students doing in a video clip?
- How should we analyze their interaction?
- What methods can we use to analyze the methods they use to interact?
- How can we understand, evaluate and re-design educational interventions – What analytic methods do we have to understand learning practices in design-based research?

How should we understand *collaborative* learning?

- Should we view a group as the sum of its individual members?
- Or should we view the group as an emergent phenomenon with its own ideas?
- What is the relation of the individuals to their group?

Multiple units of analysis

- The tradition in education and psychology methodologies is to focus on the *individual person* as the unit of analysis: what is the person doing, thinking, intending, learning
- The tradition in sociology and anthropology methodologies is to focus on the *social unit or culture* as the unit of analysis: what are the norms, institutions, values, rules
- CSCL work may benefit from also focusing on the *small group* as the unit of analysis: what is happening in the interaction, discourse, shared meaning-making

Distinguish perspectives

agent	*activity*
Individual	**Interpretation**
Small Group	**Meaning-making**
Community of practice	**Social practice**
Researcher	**Analysis**
Educational innovator	**Design**

3 Theories of Collaborative Learning

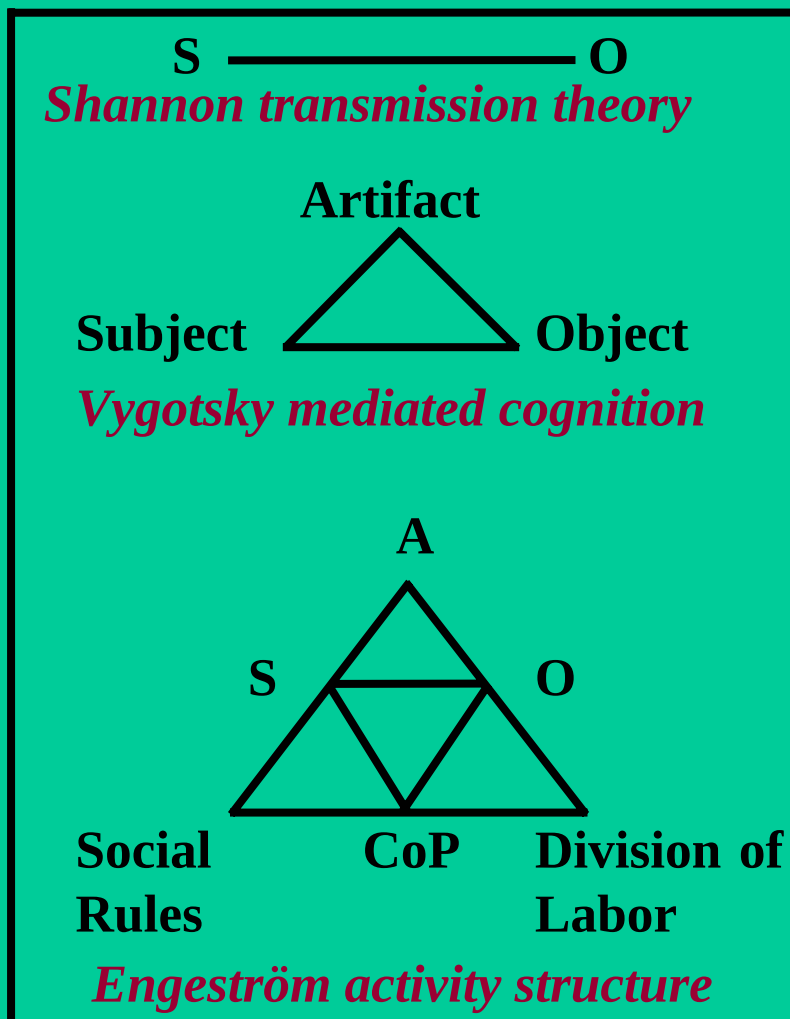
- Vygotsky: internalization – often taken as a focus on the *individual* psychology
- Lave: participation in community practice – often taken as a focus on the *community* sociology
- Small groups as engine of knowledge building – focus on the *intermediate* unit of analysis

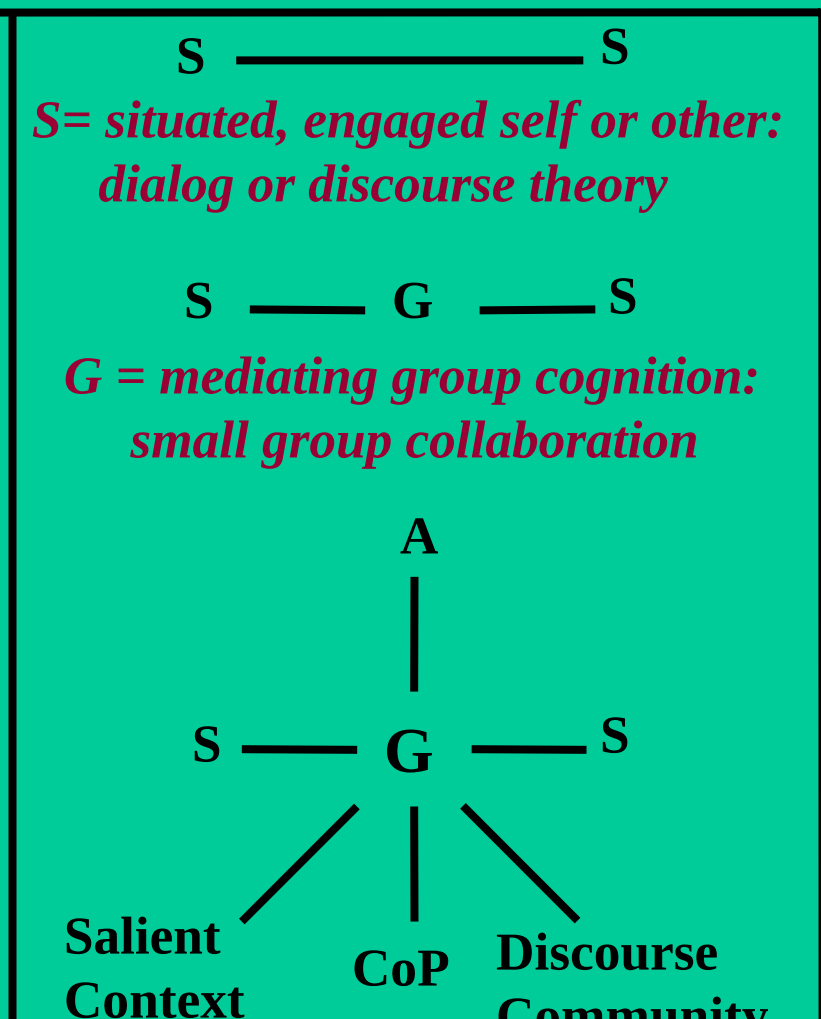
Groups rock!

Some research hypotheses for future empirical investigation and for a theory of small group cognition grounded in such analysis:

- The *small group* is the unit that mediates between individual learning and community learning.
- *Community* participation takes place primarily within small group activities.
- *Individual* learning is acquired through participation in these small group activities.
- Both individual identities and community practices are formed through small group activities.

Group activity theory





- Activity Theory

Mediation of Group Cognition

Group cognition

- Cognition = thought = logic = coherent sequence of meaningful units
- Rationality as sequentiality
  - Sentence, argument, proof
- Dyadic conversation as sequentiality
  - Conversation analysis: turn-taking dialog (sequencing), building common ground (group meaning)
- Small group cognition as sequentiality
  - Interpretation, negotiation, meaning-making

Voices intertwine into 1 cognitive act

In the following transcript from the SimRocket video clip:

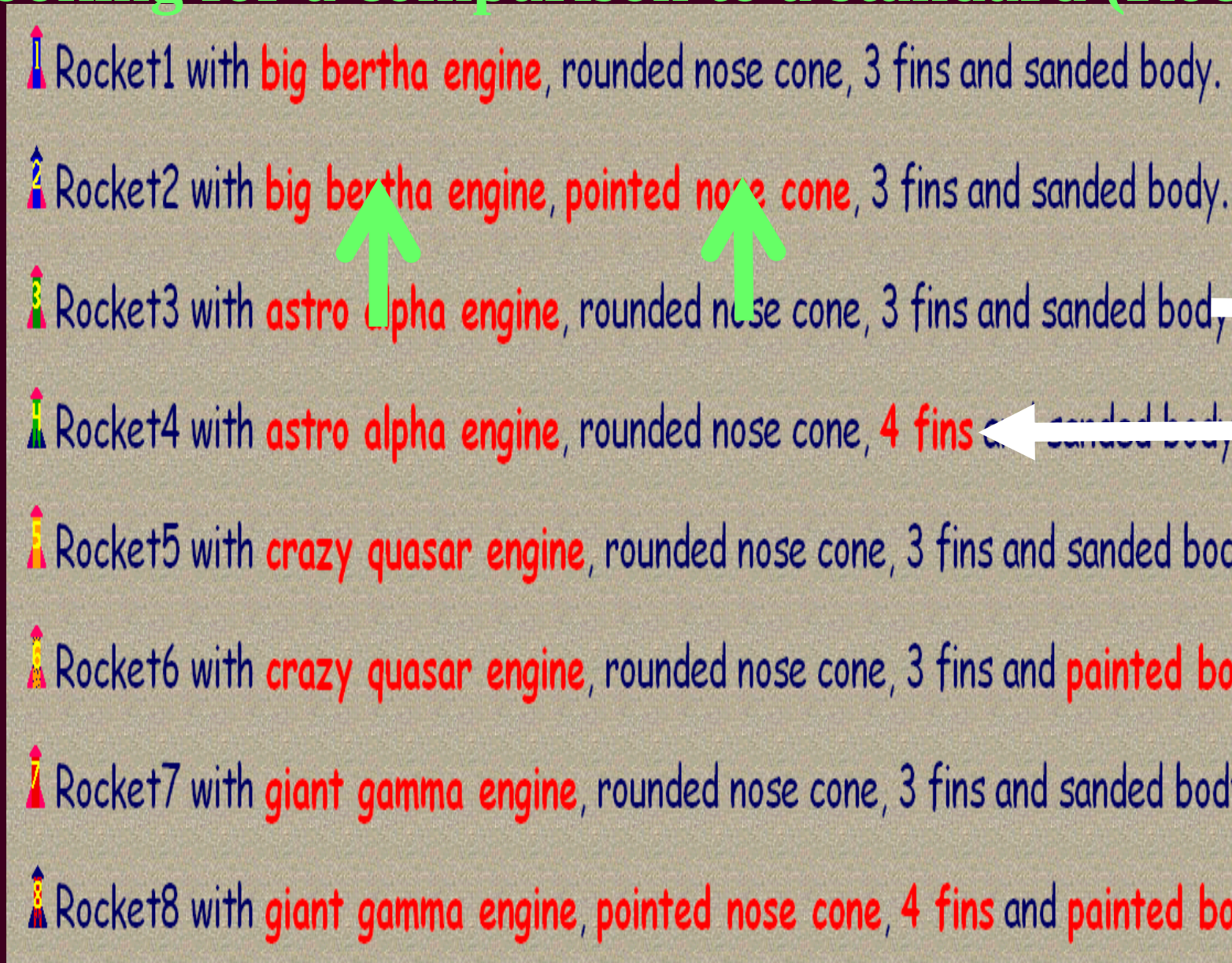
- Utterances build sequentially
- Each is interpreted by later utterances
- Each refers to previous utterances
- They reference (index) artifacts
- They are situated in the network of their references

Individual utterances are meaning-less

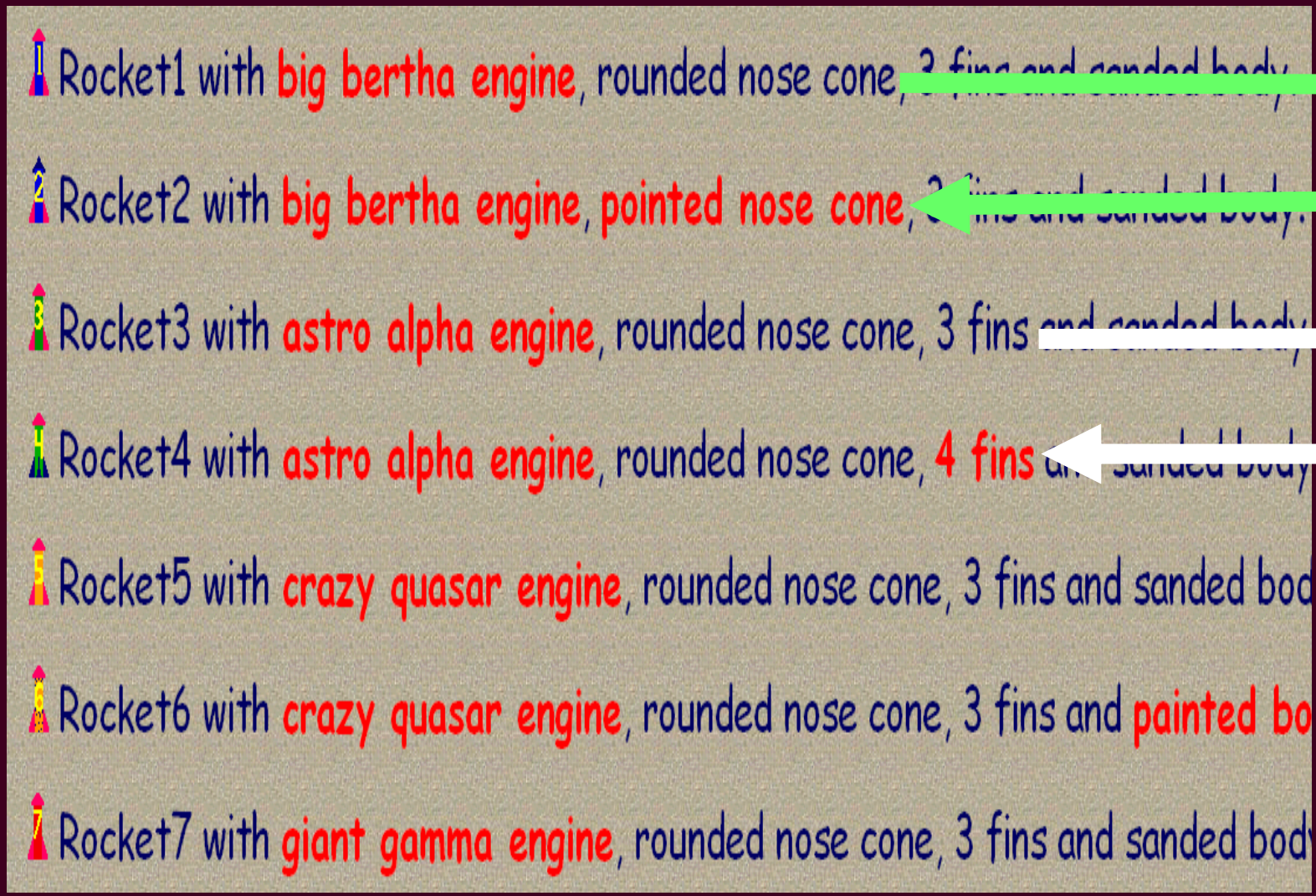
- 1:22:05 Brent This one's different
- 1:22:06 Jamie Yeah, but it has same no…
- 1:22:08 Chuck Pointy nose cone
- 1:22:09 Steven Oh, yeah
- 1:22:10 Chuck But it's not the same engine
- 1:22:11 Jamie Yeah, it is,
- 1:22:12 Brent Yes it is,
- 1:22:13 Jamie Compare two n one
- 1:22:13 Brent Number two
- 1:22:14 Chuck I know.
- 1:22:15 Jamie Are the same
- 1:22:16 Chuck Oh
- 1:22:17 Brent It's the same engine.
- 1:22:18 Jamie So if you compare two n one,
- 1:22:19 Chuck Oh yeah, I see, I see, I see

Cognitive change by the group

Looking for a comparison to a standard (Rocket 3)



The group sees differently



See list as pairs of comparatives (Rocket 1 & 2)

SimRocket video

simrocket.avi

Mind as cognitive artifacts

- Group underwent cognitive change
- Shift in viewing “as”: list as structured
- Gave new shared meaning to list artifact
- Interactively constructed a new conceptual tool: paired configurations
- Individuals can internalize this as a “cognitive artifact” – expand their minds

Varieties of collaborative learning

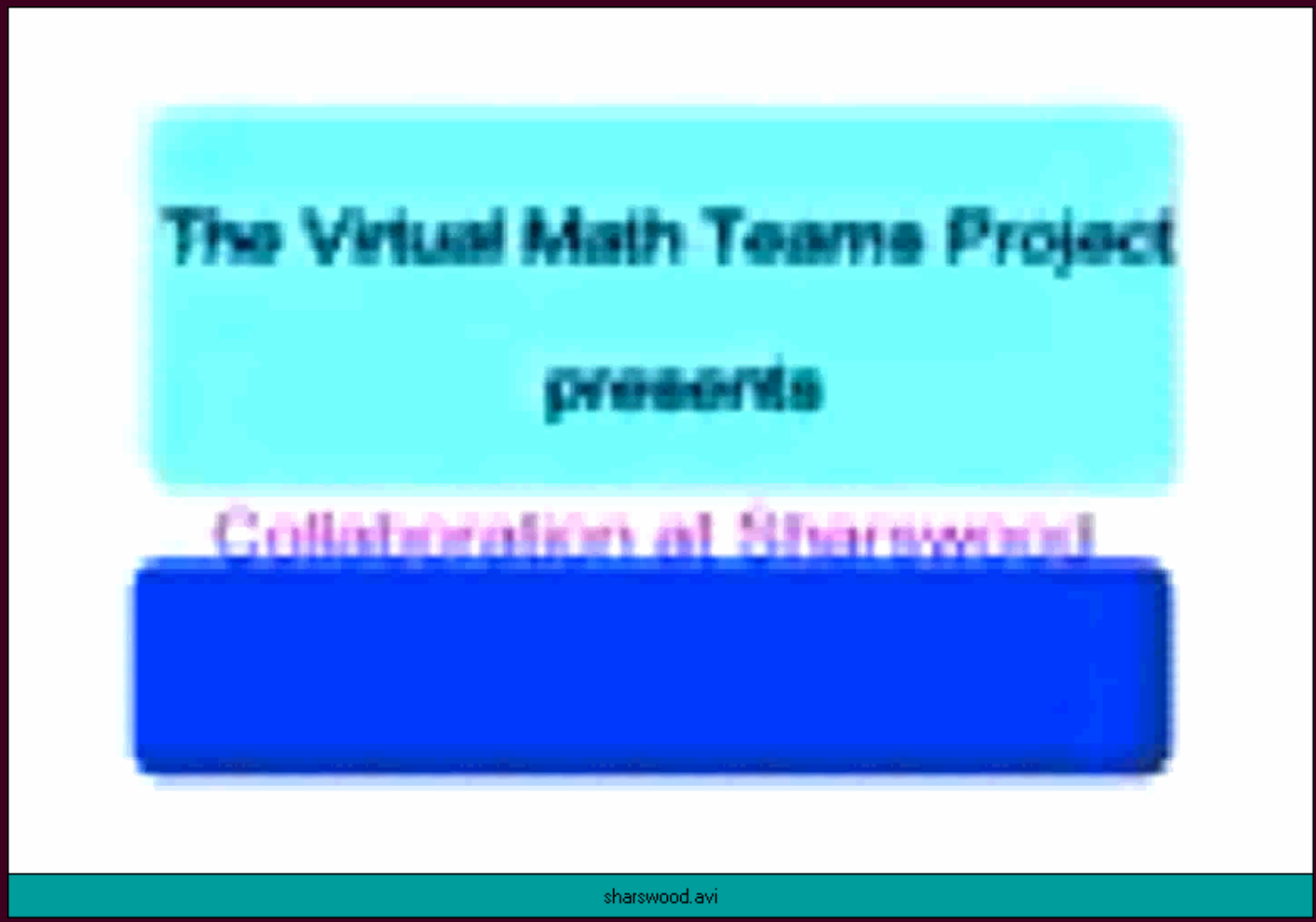
- Middle school public school math classroom in South Philadelphia
- Students work independently in groups
- But in parallel – in synch
- Help each other; maintain synch
- Negotiate & share meanings

Individual → group → individual

- As in SimRocket (middle school public classroom in North Boulder),
- actions of individuals interact
- and their interpretations intertwine
- to produce shared group meanings
- Different ways of collaborating, different classroom norms, different group practices

Parallel collaboration at Sharswood

A collaborative math class
Sharswood Middle School
Philadelphia School District



sharswood.avi

Making learning visible

- Participants must make their learning & understanding visible to each other in order to collaborate
- Video makes their displays visible to researchers: persistent & repeatable
- We can identify member methods of interaction, practices of enactment
- Practices can serve as analytic items

Doing ignorance

Erasure

by Prof. Wesley Shumar

Math Forum ethnographer

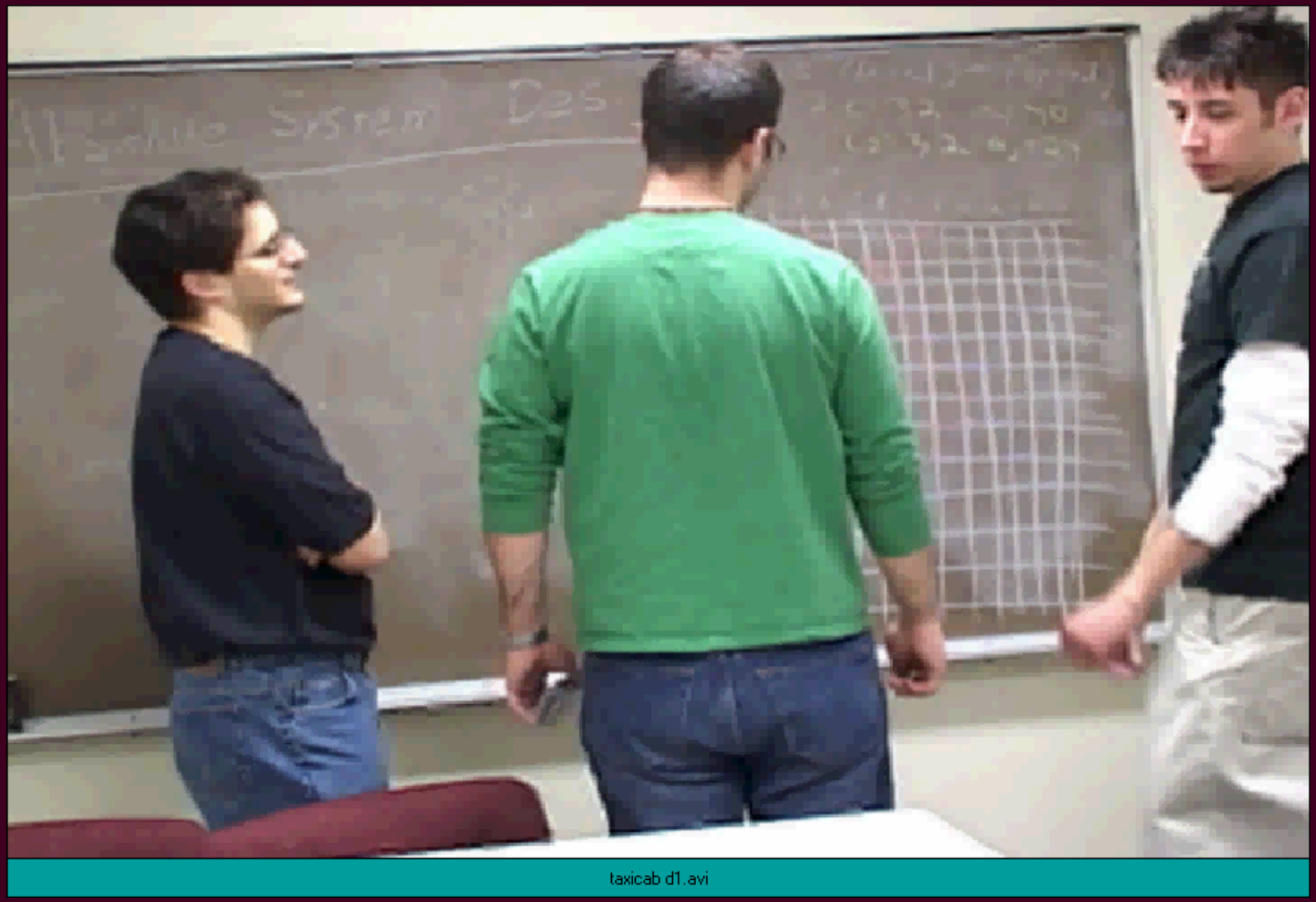
erasure bw.avi

Collaborating on math

- Individuals contribute proposals
- Checking of each other's proposals
- Negotiation of agreement
  - Not just correct math
  - But also shared meaning
- Synch of bodies as roles change

Computing π

- College students at Drexel



taxicab d1.avi

Constructing new math

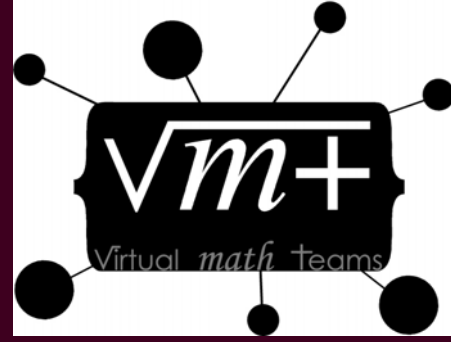
- Synch of bodies as roles change
- Defining the problem collaboratively
- Negotiation of agreement
  - Not just correct math
  - But also creating something new
  - Enjoying the interaction
    - Socially and intellectually

“Rocking taxicab geometry” – constructing new math

- College students at Drexel

taxicab d2.avi

Virtual Math Teams



- Students come to Math Forum and register to join an online team of students to discuss an interesting math problem from the Problem of the Week (PoW)
- They meet in a collaboration chat room (PowWow) for about an hour
- Year 1 of a 5 year research project to design problems, group formation procedures, collaboration supports, software media, research methods

Doing problem solving

- The group constructs steps of a math proof or problem solution
- The members negotiate each step
- The solution is carried out as social discourse:
  - It includes social interaction
  - Building personal identities
  - Recognition & power relationships
  - Reflection on the interaction
  - etc.

Intertwining group meaning-making & individual interpretation

- As the group builds toward a solution,
- individuals reconcile their interpretations
- and agree on each step
- or discuss until they agree
- This way, opinions are checked from multiple perspectives until tentatively accepted as shared group knowledge
- And the group knowledge (shared meaning) is incorporated in the personal understandings (individual interpretations)

group	AVR	45	8:21:46	Okay, I think we should start with the formula for the area of a triangle
g	SUP	46	8:22:17	ok
g	AVR	47	8:22:28	A = 1/2bh
g	AVR	48	8:22:31	I believe
g	PIN	49	8:22:35	yes
g	PIN	50	8:22:37	i concue
g	PIN	51	8:22:39	concur*
g	AVR	52	8:22:42	then find the area of each triangle
g	AVR	53	8:22:54	oh, wait
g	SUP	54	8:23:03	the base and heigth are 9 and 12 right?
g	AVR	55	8:23:11	no
g	SUP	56	8:23:16	o
g	AVR	57	8:23:16	that's two separate triangles
g	SUP	58	8:23:19	ooo
g	SUP	59	8:23:20	ok
g	AVR	60	8:23:21	right
g	AVR	61	8:23:27	i think we have to figure out the height by ourselves
g	AVR	62	8:23:29	if possible
g	PIN	63	8:24:05	i know how
g	PIN	64	8:24:09	draw the altitude'
g	AVR	65	8:24:09	how?
g	AVR	66	8:24:15	right
g	SUP	67	8:24:19	proportions?
g	AVR	68	8:24:19	this is frustrating
g	AVR	69	8:24:22	I don't have enough paper
g	PIN	70	8:24:43	i think i got it
g	PIN	71	8:24:54	its a 30/60/90 triangle
g	AVR	72	8:25:06	I see

1
2
3
4
5
6

VMT Chat log

propose

confirm

discuss

A research agenda

Here are some theoretical issues investigated in part III of my book as part of a research program focused on the small group unit of analysis:

- Can we learn from traditional communication theories and technologies how to support online small groups? (chapter 14)
- Can processes of group cognition provide a basis for individual cognition and learning? (chapter 15)
- Can we identify meaning-making and knowledge-building at the group unit? (chapter 16)
- Can we understand how group meaning is shared among group members? (chapter 17)
- Can we make learning visible in group discourse, so we do not have to be confined to measuring indirect learning outcomes? (chapter 18)
- Can we say that it is possible for a group as such to think / learn / build knowledge / construct meanings that cannot be attributed to any of the group members individually? (chapter 19)
- Can we develop new conceptions of group discourse that might open up innovative approaches to fostering group cognition? (chapter 20)

Group discourse

- The group discourse is the medium in which shared meaning is constructed during collaboration
- Ask what an utterance means (what role it plays, how it is used, what work it does) in the discourse, rather than what the speaker had "in mind"
- Participants offer their interpretations from their personal perspectives
- These are intertwined and established as shared before the group can go on

Group cognition

- Group cognition emerges as shared discourse
- It provides ideas, vocabulary, artifacts & meanings for both individual participants and for their community of practice
- To study learning, knowledge-building, meaning-making, collaboration, etc. we should focus on the small group as unit of analysis and make visible the emergence of group cognition from the intertwining of individual efforts
- A focus on group cognition does not minimize the possibility of individual intelligence – rather, it shows the origin of meanings, artifacts, language, mental skills, motivations and behaviors that make individual intelligence possible as more than animal instincts

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this presentation:

www.cis.drexel.edu/faculty/gerry/europe.html

forthcoming book:

www.cis.drexel.edu/faculty/gerry/mit

new journal:

ijCSCL.org