Computer-Supported Collaborative Learning (CSCL), Virtual Math Teams (VMT), Group Cognition
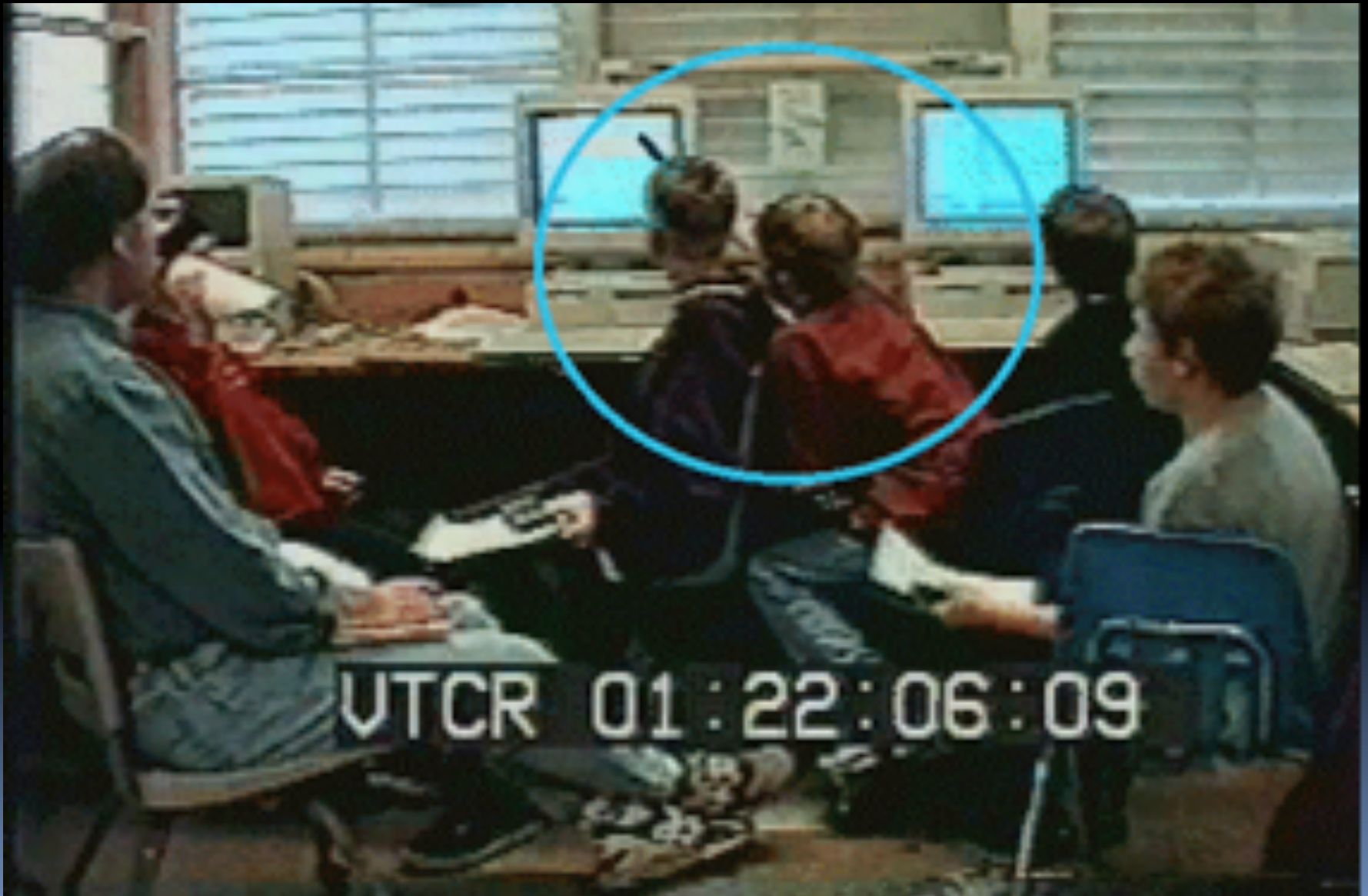
Gerry Stahl

Communications Analysis Workshop
February 16-18, 2010
Fiesta Resort & Conference Center, Tempe, Arizona

CSCL: computer-supported collaborative learning

CSCL: computer-supported collaborative learning

- Networked computers allow students to work, learn, explore and think in small groups of peers connected globally
- … to take advantage of online resources
- … to take advantage of computational support, simulations, tools, visualizations
- … to be scaffolded and guided by teachers, peers, agents
- … to make their thinking visible, subject to other perspectives, checking, reflection, persistence, audience

3

Issues of Team Cognition & Communications Analysis

- How do teams of students in CSCL settings
- … engage in distributed cognition?
- … approach, negotiate, coordinate their tasks?
- … problem solve and achieve cognitive results?
- How can we analyze their communications to answer these questions?
- … generate and capture adequate data
- … analyze the communicative interactions
- … draw theoretically interesting findings & practically effective lessons

VMT: virtual math teams

The virtual math teams project

- At Drexel University, College of Info Sci & the MathForum.com from 2002 to the present
- Software collaboration platform: portal, chat, shared whiteboard, multi-user dynamic math, web browsers, wiki, social networking
- Research service (not yet released globally), over 1000 mostly hour-long sessions with 3-4 K-12 students
- Many publications, mostly case studies
- "top of the wedding cake"

Issues of Team Cognition & Communications Analysis

- Design-based research conducts empirical exploration within practical design context
- All interactions at the group unit of analysis are captured objectively, ready for analysis
- Interaction analysis using group data sessions
- Sequential analysis based on EM/CA

Analyzing Group Cognition

Group Cognition

- A form of distributed cognition that has not been the focus of most other studies, like activity theory or CSCW, which focus on socio-technical artifact use

- How is cognition accomplished at the small-group unit of analysis?

- Not treating the group as secondary to the individual (solo+) or to the social (socio-cultural)

- Analyze the co-construction of cognitive achievements through transactive up-take, as seen in sequential structures of communication & action in shared world

- E.g., indexicality of reference grounded in the joint problem space

Levels of communicative structure

**Group-cognitive actions by groups
are achieved through the building
of sequential relationships
at many levels of granularity
among contributions by multiple participants**

Reference: **network of meaning, indexical ground**
Utterance: **recipient design for reading's work**
Pair: **projection and uptake**
Move: **getting the problem-solving work done**
Theme: **coherent interactional sequence**
Session: **temporal structuring and re-membering**
Event: **forming groups and co-constructing
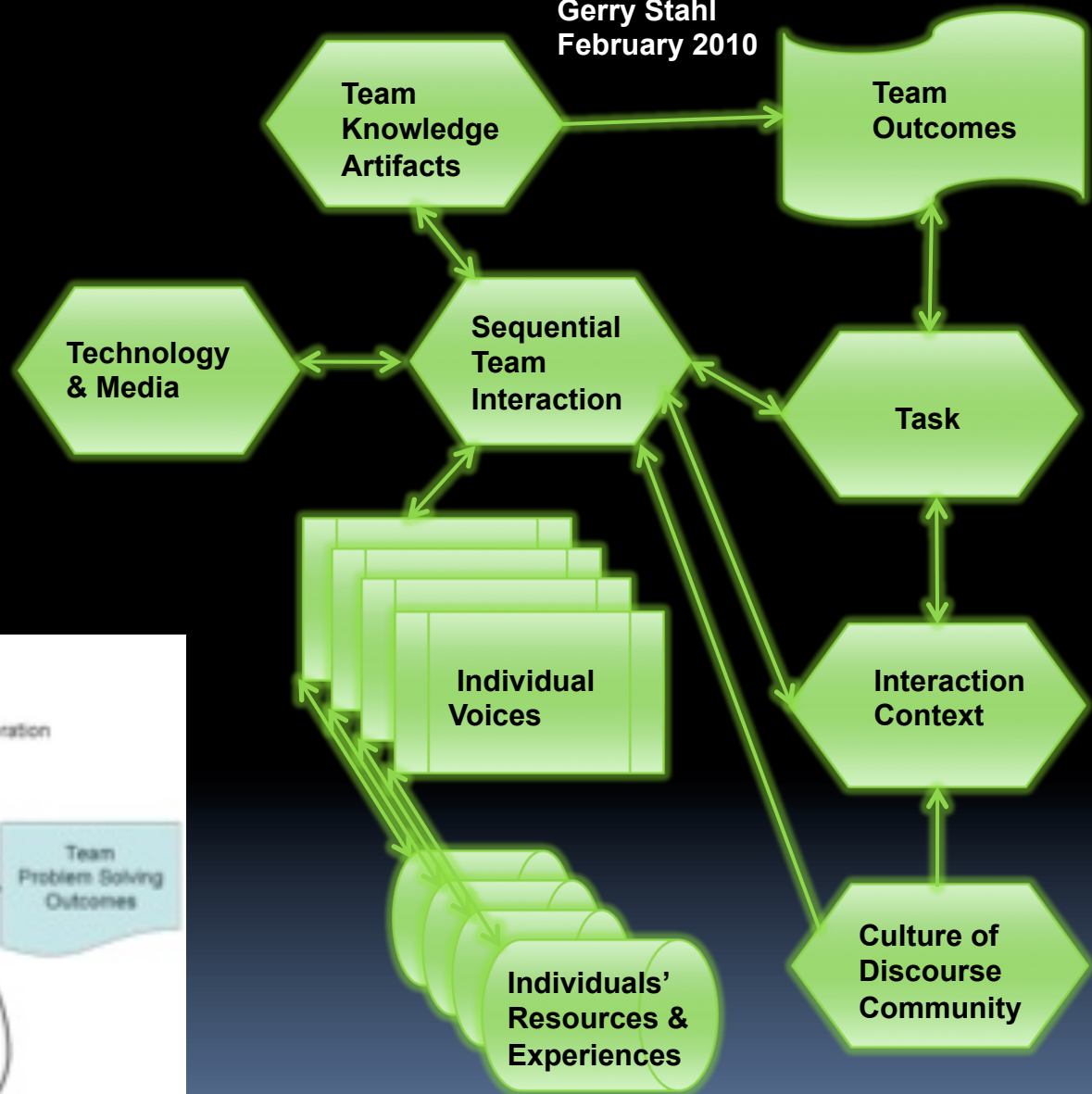   knowledge artifacts**

| | | Log of Team B | | VMT Spring Fest | | 2006 | | | | | | | | |
| | | Group Event: Team B in VMT Spring Fest 2006 | | Online Session: Session 4, May 18, 2006 | | | | | | | | | | |

Line #	Date	Time Start Typing	Time Posting	Duration of Pause	Bwang8	Aznx	Quicksilver	Gerry	J	Explicit Ref	Threading	Utterance Category	Adjacency Pair	Discourse Move	Conve Theme
1204	5/18/06	19:04:09	19:04:10	0:00:21		Hm.					1203	proposal response			Select
	5/18/06		19:04:16	0:00:06			[Quicksilver resized some objects]								Select
1205	5/18/06	19:04:11	19:04:16	0:00:00		Let's make a new problem					1204	proposal bid	proposal	open selection of a new problem	Select
1206	5/18/06	19:03:57	19:04:18	0:00:02	the pryamid one that we didn't finish last time						1205	proposal bid	proposal		Select
1207	5/18/06	19:04:17	19:04:21	0:00:03		Not necessarily 3-D					1205	proposal bid	proposal		Select
	5/18/06	19:04:25	19:04:26	0:00:05			[user erased message]								Select
1208	5/18/06	19:04:25	19:04:26	0:00:00		Yeah					1206	proposal response			Select
	5/18/06	19:04:27	19:04:29	0:00:03			[user erased message]								Select
1209	5/18/06	19:04:30	19:04:31	0:00:02			ok				1208	proposal response			Select
1210	5/18/06	19:04:28	19:04:32	0:00:01		let's do the pyramid one					1206	proposal bid	proposal		Select
	5/18/06	19:04:39	19:04:39	0:00:07			[user erased message]								Select
	5/18/06	19:04:50	19:04:56	0:00:17			[user erased message]								Select
1212	5/18/06	19:05:03	19:05:09	0:00:13		How do you remove things from the board?					none	question bid	question	open technical question	Select
	5/18/06		19:05:10	0:00:01			[START:TextEditing]								Select
1213	5/18/06	19:05:14	19:05:18	0:00:08			u select and delete				1212	question response			Select
1214	5/18/06	19:05:01	19:05:22	0:00:04	it is the 2 flat sided pyramid						1210	proposal response			Select
	5/18/06	19:05:28	19:05:32	0:00:10	[user erased message]										Select
1215	5/18/06	19:05:28	19:05:34	0:00:02			oh yes....like the corner of a room				1214	proposal response			Select
	5/18/06		19:05:36	0:00:02		[Aznx moved some object/s]									Select
1216	5/18/06	19:05:33	19:05:42	0:00:06	by the way check out our wiki page						none	proposal bid	proposal	open review of wiki	Select
1217	5/18/06	19:05:43	19:05:45	0:00:03		How do you delete?					1212	question bid	question		Select
1218	5/18/06	19:05:45	19:05:45	0:00:00			ok				1216	proposal response			Select
1220	5/18/06	19:05:43	19:05:48	0:00:03	i updated some stuff						1216	+			Select
1221	5/18/06	19:05:49	19:05:52	0:00:04		I see how you select.					1217	+			Select
1222	5/18/06	19:05:56	19:05:58	0:00:06		But how to delete?					1221	+			Select
1223	5/18/06	19:05:56	19:06:06	0:00:08	del button on your keyboard would work						1222	question response			Select
	5/18/06	19:06:07	19:06:10	0:00:04			[user erased message]								Select
	5/18/06		19:06:10	0:00:00		[Aznx deleted some object/s]									Select
1224	5/18/06	19:06:10	19:06:11	0:00:01			yea				1223	question response		close technical question	Select

A Model of Group Cognition
Gerry Stahl
February 2010

Team Knowledge Artifacts

Team Outcomes

Technology & Media

Sequential Team Interaction

Task

A Model of Macrocognition January 2010

Individual Voices

Interaction Context

Externalized Team Knowledge

Moderation

Moderation

Internalized Knowledge

Team Knowledge Building Processes

Team Problem Solving Outcomes

Individual Knowledge Building Processes

Feedback Loops

Individuals' Resources & Experiences

Culture of Discourse Community
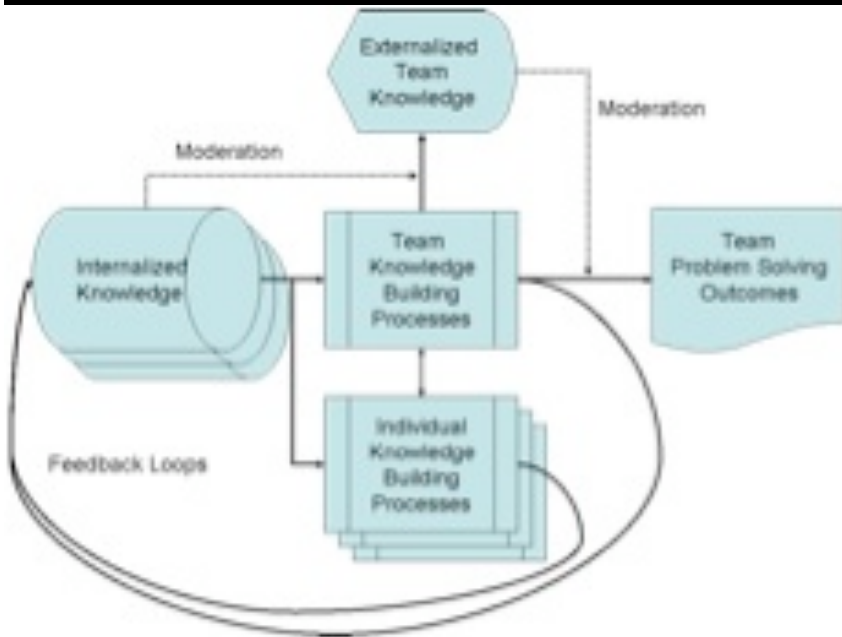
Individual contributions to group cognition in the team interaction are inter-related at many levels under complex constraints in non-determinate rule-governed ways

	A	B	C	D	E	F	G	H
1	Time	Comm unicati on from:	Comm unicati on to:	Purpose of communica tion	Content of communication	Outcomes of communic ation	Supporting artefacts	Data code
43	15:38	BN	BN	To inform echo won't be done until tomorro and that he will remove some lines.	Echo aren't coming til tomorrow so I'll get the (lines?) out	Agreed the lines will be removed	drug/feed tubes	planning
44	15:40	BN	BN	Establish whereabout s of endoscope.	Endoscope to hand anywhere?	BN says he put it "out there"		execution
45	15:51	Ward clark	BN	Requests the BN move patient onto left side as echo team are arriving shortly.	Echo - yes - now? I've been told it needs to be done today. They want to come now. Can the patient be rolled on her left side? If she has to. Left side please. They'll be here in 5. When they get here I'll worry about it then. She doesnt need the defibrillator...30 to 40 minutes or so..	Nurse continues speaking with patient's mother	nil	execution
46	15:56	Echo special ist	BN	To complete echo and share information from it.	I'm here to do the ultra sound. Can she go on her left - is that uncomfortable for her? No she's sedated. She's not had the greatest day, we'll see how she goes. Can we roll her sitting up abit, that ok with you. That's fine. Do we know height and weight? I'll have a look. Yep, got height and weight. I'll turn sedation up for you.... arre we on propofol. How much levo? She on 4 of levo. She's got a swan in. Does she have CVP? Yes - 8. Height is 177. Weight is 60....... can you put bed up a smidge? Has she got swan in or pacing? Swan. Can you see that? Don't usually see that imaging... how long ago was transplant? day 6 today. How did it go? She hasnt got severe TCR anymore, she's got mild, moderate... 3 3's are 9 = 36 plus CVP of 8, so it's at 44...LV function normal, RV still dilated and moderately reduced but it's improved.. good news...	Patient has echo and BN is updated on ultrasound results.	Echo machine	execution/pla nning
47	16:25	lung transpl ant physic an	Res	Theorising possible causes of complication s?	(initial conversation out of range)..The other one's a very rare kind of hyperomia sydrome that I've only ever seen ..very unlikely with the explanation....the one case we've seen the liver was playing up a bit we didn't appreciate that you can have one number way out of proportion enough to call (ventral cerebral leno) - this is due to cyclo?. yeah. a bizarre rare effect. Only seen one case out of 1000's of lungs..but it's a cheap test. . ...yes exactly but she's day 6 . ICU Attending isnt worried about it - maybe nothing. Just to think about it and be one step ahead of any problems. The cyclo story, if it's there…. This stage, the lungs will sort themselves out.	No decisions made, staff have shared knowledge.	nil	planning
	17:10	BN	Nurse	sharing frustration	I wanna get the drains out so I can do other stuff, but no-one's around.... Nevermind	nurse continues to wait for a	nil	planning

Issues of Team Cognition & Communication in the ICU

- First thing I notice is the patient (or family) is not involved, even on a human social level or to find out how the patient feels. Why meet in the patient room if the patient is not involved?

- The spreadsheet is not structured interactionally or conversationally.

- I would be interested in how the medical team builds its knowledge about the patient condition and then makes its decisions in an on-going way, throughout the day and from day to day. How is this knowledge shared, co-constructed, preserved, remembered, etc. What are the roles of artifacts (e.g., paper forms)? What are the roles and relations of the team members -- how do they adhere to and deviate from or improvise around their hierarchical positions in the hospital system and how do they enact or realize these roles in practice?

- I would approach these questions by looking at the sequential structure of the interactions -- looking at who initiates discourse topics and how they do that, how people position each other to play specific roles, how knowledge is co-constructed and gaps in knowledge are identified in this flow of discourse.

My Focus on Team Cognition & Communications Analysis

- I am only concerned with what is shared by the group – not in individual or cultural cognition. They are inseparable, but other researchers analyze them exclusively. I want to see what cognition looks like from a group perspective and I hypothesize (with Vygotsky) that intersubjective experience, cognition and learning can be seen as primary.

- What can communication analysis grounded in multi-level sequential analysis reveal about:

- -- how teams: plan tasks, solve problems, make intersubjective sense, produce group artifacts, position members in roles, enact effective teams and accomplish group cognition

- -- the nature of problems that teams confront: common ground, indexical reference, shared meaning, joint problem space, information behavior, coordination, recipient design of communication and reconstruction of communication coherence

15

For Further Information

- Workshop at ICLS 2010 in Chicago

- International Journal of CSCL

- Slides: http://www.slideshare.net/Gerry.Stahl

- Website: http://GerryStahl.net

- Email: Gerry.Stahl@drexel.edu

- *Group Cognition* (2006, MIT Press)

- *Studying Virtual Math Teams* (2009, Springer)

The **i** **School** at **Drexel**
College of Information Science and Technology

√m+

16