

Knowledge Co-construction and Object-oriented Collaboration  
*A Study of Learning through Collaborative Construction of Knowledge Objects  
in Higher Education*

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Dissertation submitted for the degree of PhD

Department of Education  
Faculty of Educational Sciences, University of Oslo  
June 2013

# DAMSA'S MODEL AS A KNOWLEDGE OBJECT

University of Oslo, Norway

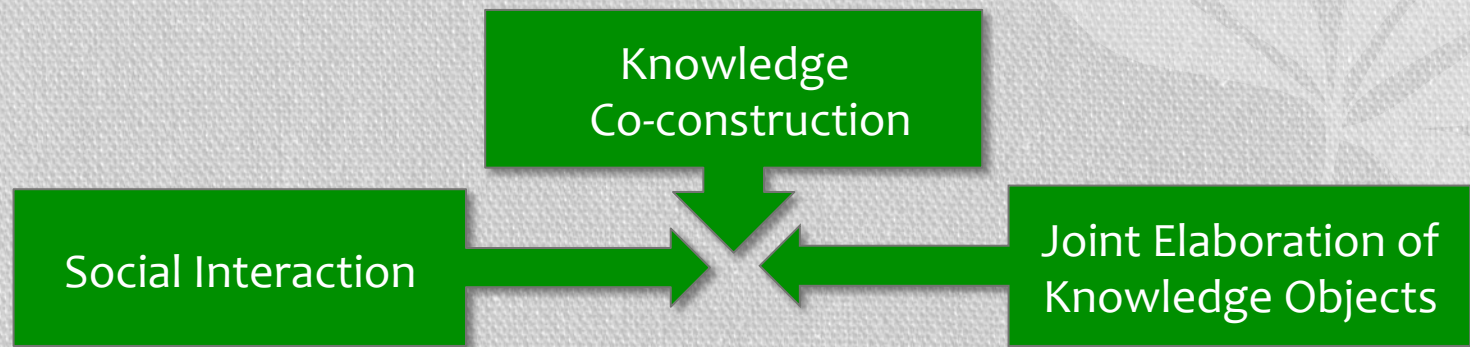
October 18, 2013

Gerry Stahl

# **Damsa's Model as a Knowledge Object**

- 1. State of the art theoretical framework**
- 2. Visualizing the coherent theoretical model**
- 3. The dissertation as a knowledge object**
- 4. Contributions to my personal perspective**
- 5. Integrating the model with VMT**
- 6. Knowledge challenges now**

# 1. State of the art theoretical framework



**For the field of CSCL (computer-supported collaborative learning), these are key current concepts in need of clarification & research.**

**Many of the leading-edge theories have been brought together, presented and extended in this dissertation.**

**The dissertation surveys in a finely tuned and strategically selective way leading-edge conceptualizations from the literatures of sociolinguistics and sociocultural CSCL.**

**In a field awash in vague theories from diverse and incommensurate historical sources, the dissertation has managed to assemble some of the most relevant, compatible and sophisticated conceptualizations. It has identified key principles and organized them around four relatively clear and distinct, though intimately inter-related concepts. It has then tested this model by applying it in four studies, each of which has stood up to peer review within the field. The four studies provide clear views of the four concepts, respectively. They also illustrate impressively the connections among the phenomena named by the concepts. This dissertation not only stands at the leading edge of theoretical, analytic and practical work in the field, but also pushes that edge forward.**

## **Should she be awarded a PhD?**

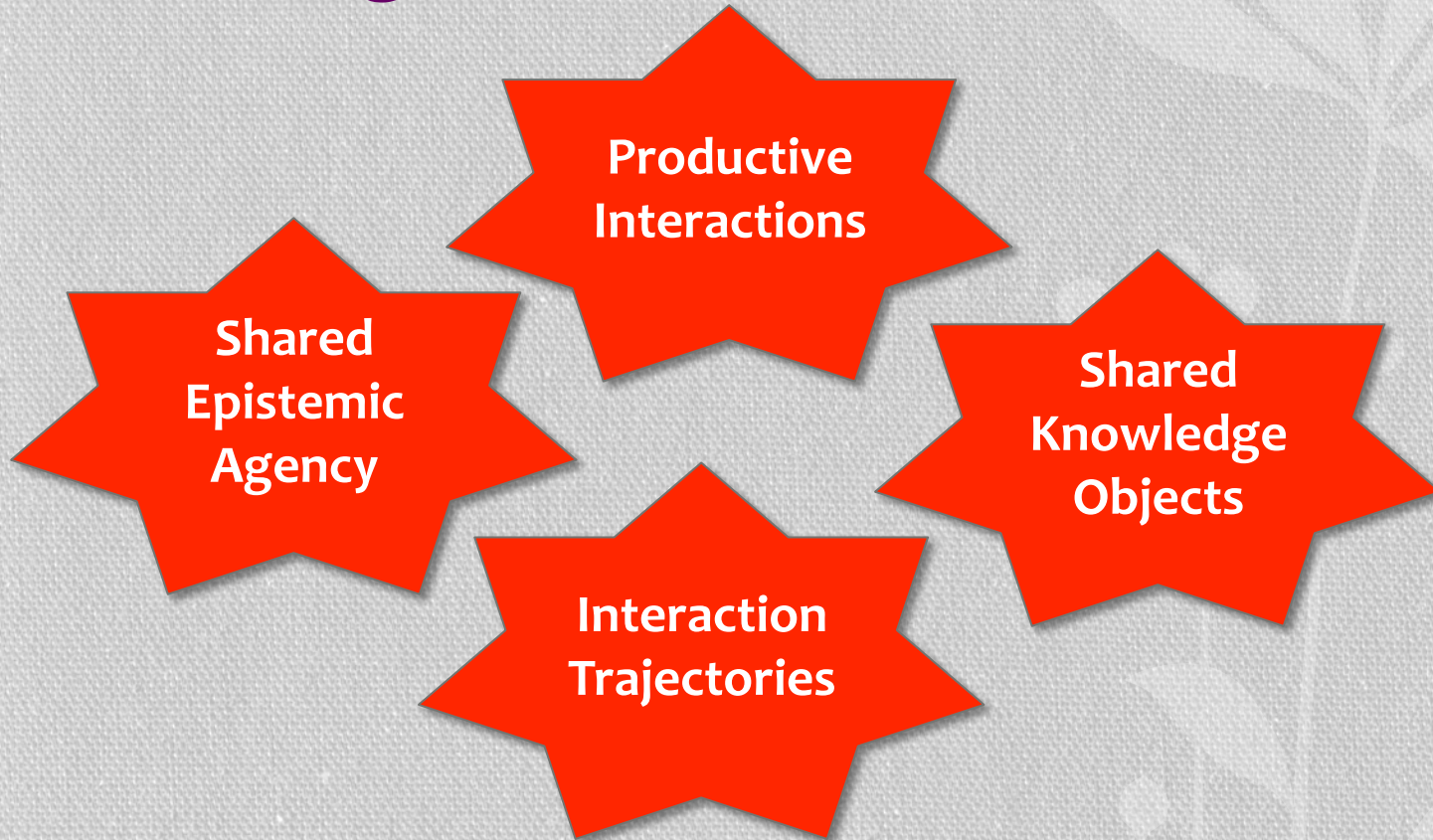
- **Did she master a specific area of the discipline?**
- **Did she demonstrate ability to conduct research?**
- **Can she articulate ideas and teach them to others?**
- **Has she opened a research agenda to pursue?**
- **Has she demonstrated appropriate maturity as a researcher in the field?**

**A doctoral education is primarily an apprenticeship in research. Gradually, the apprentice demonstrates the capacity to move into a more leadership position in the community.**

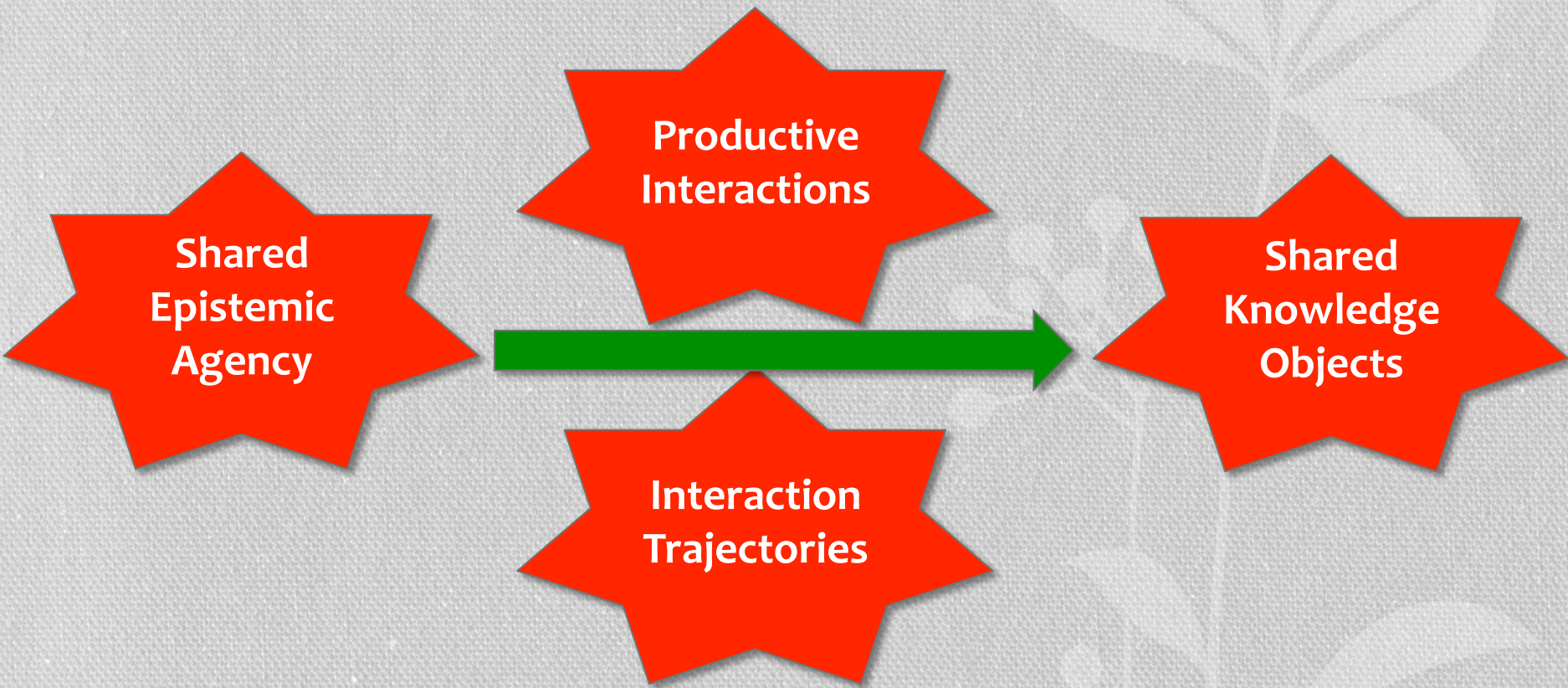
**The assessment of relevant claims and issues are a matter for judgment by experts in the field – both the local mentors and less involved people from outside.**

**We are all here today because that assessment has now been made in favor of recognizing the apprentice's impressive accomplishments.**

## 2. Visualizing the coherent theoretical model



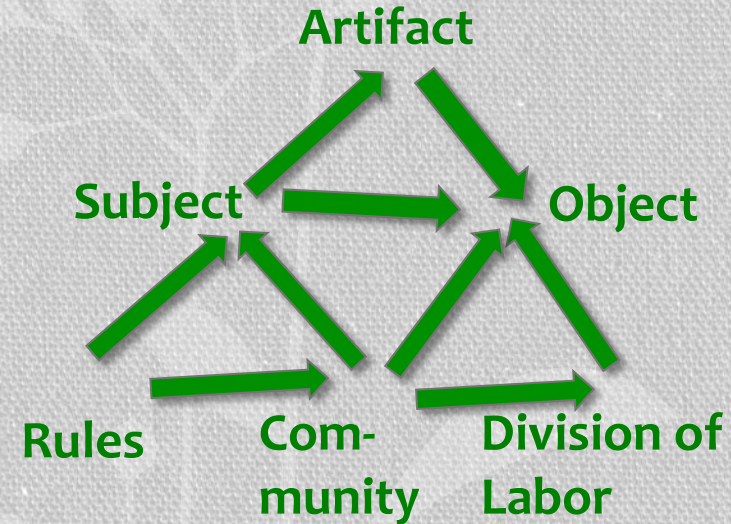
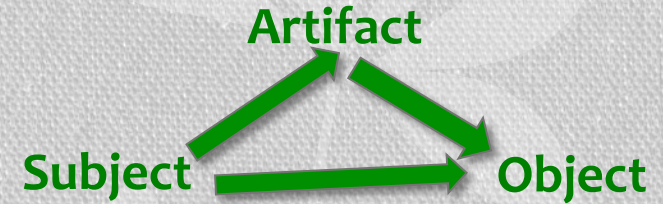
**How do these fit together to provide a theoretical model of collaborative learning?**

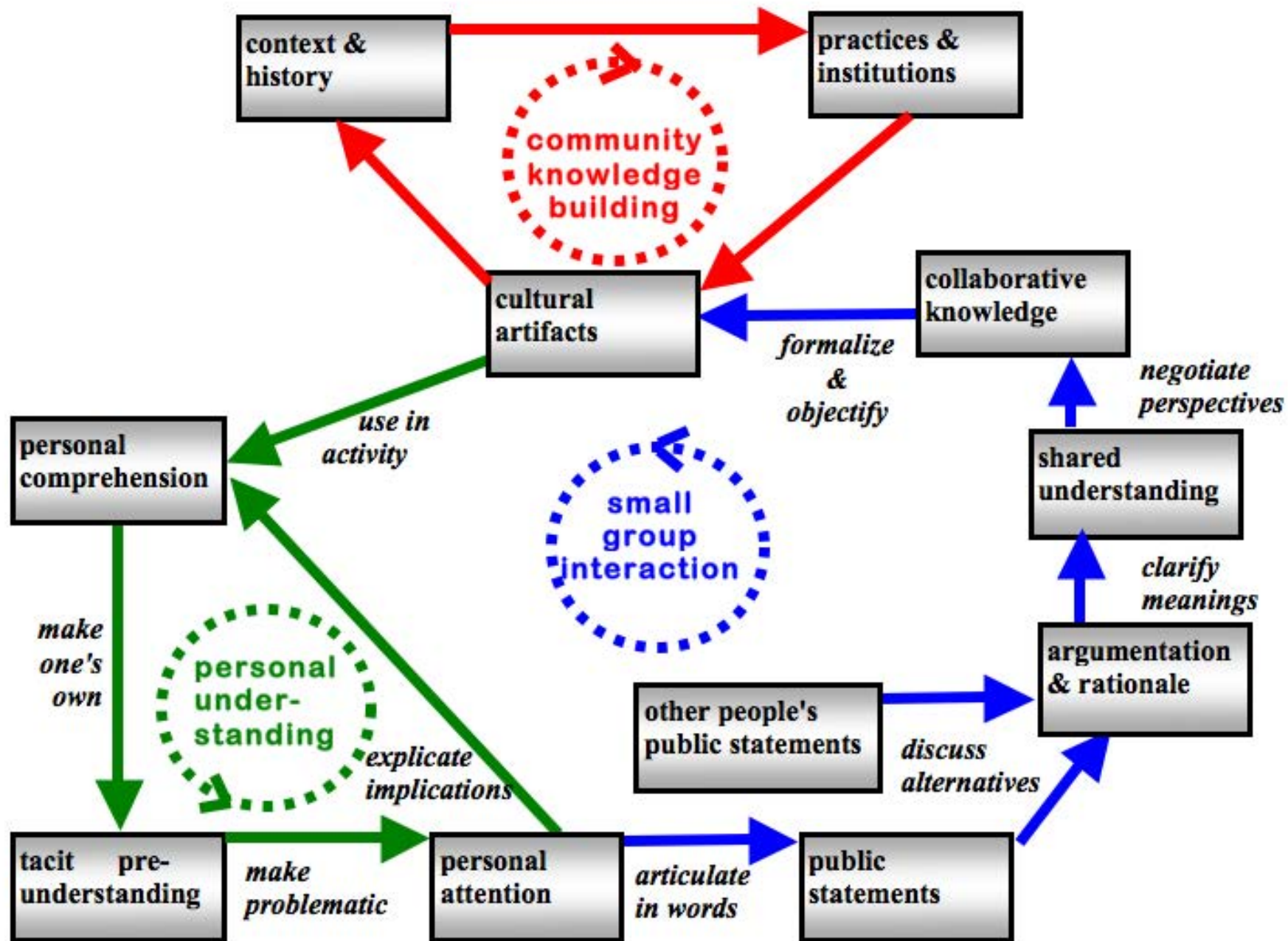


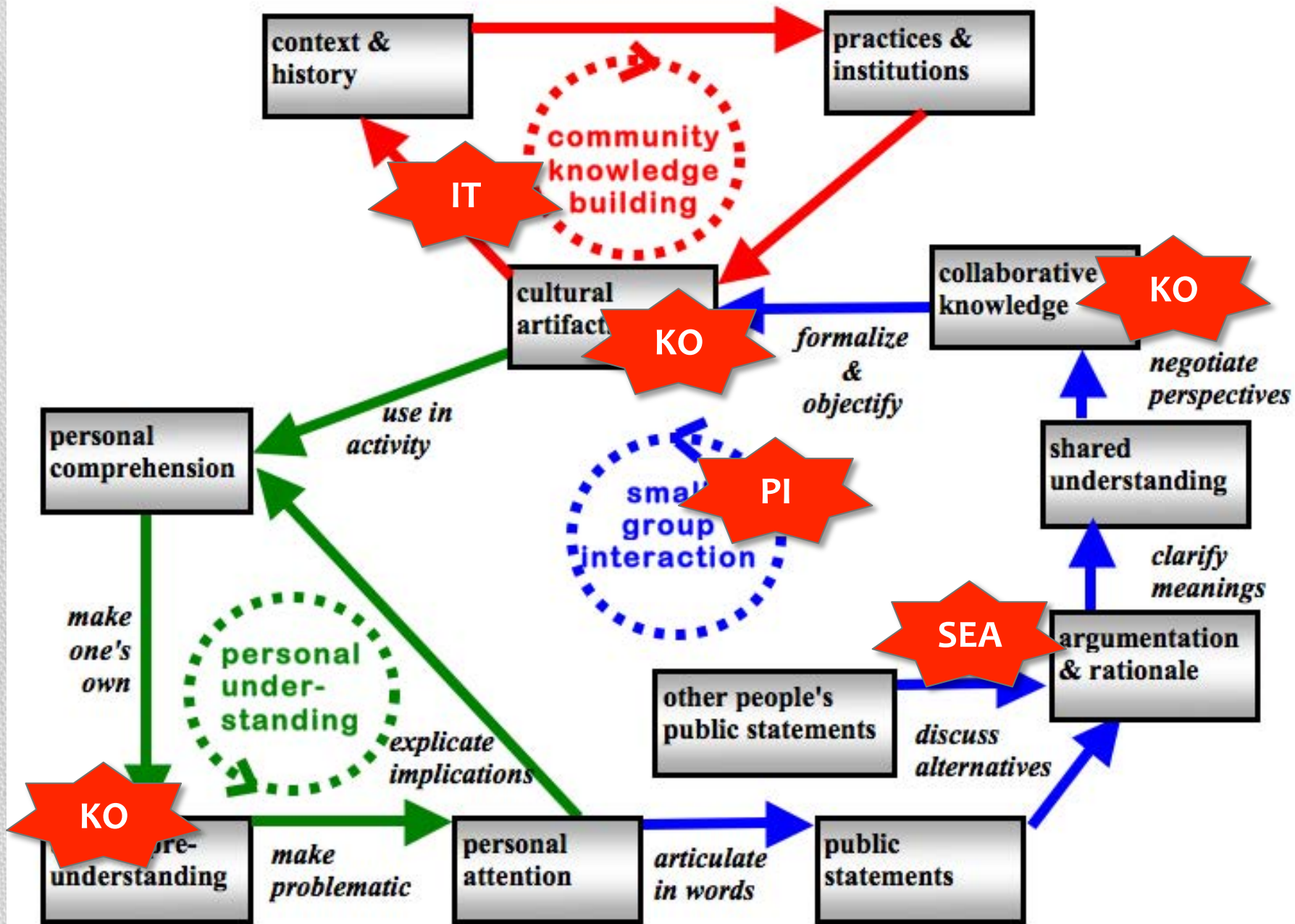
**A group (has the capacity to) develop a knowledge object. This takes place via productive interactions, which follow a trajectory over time.**



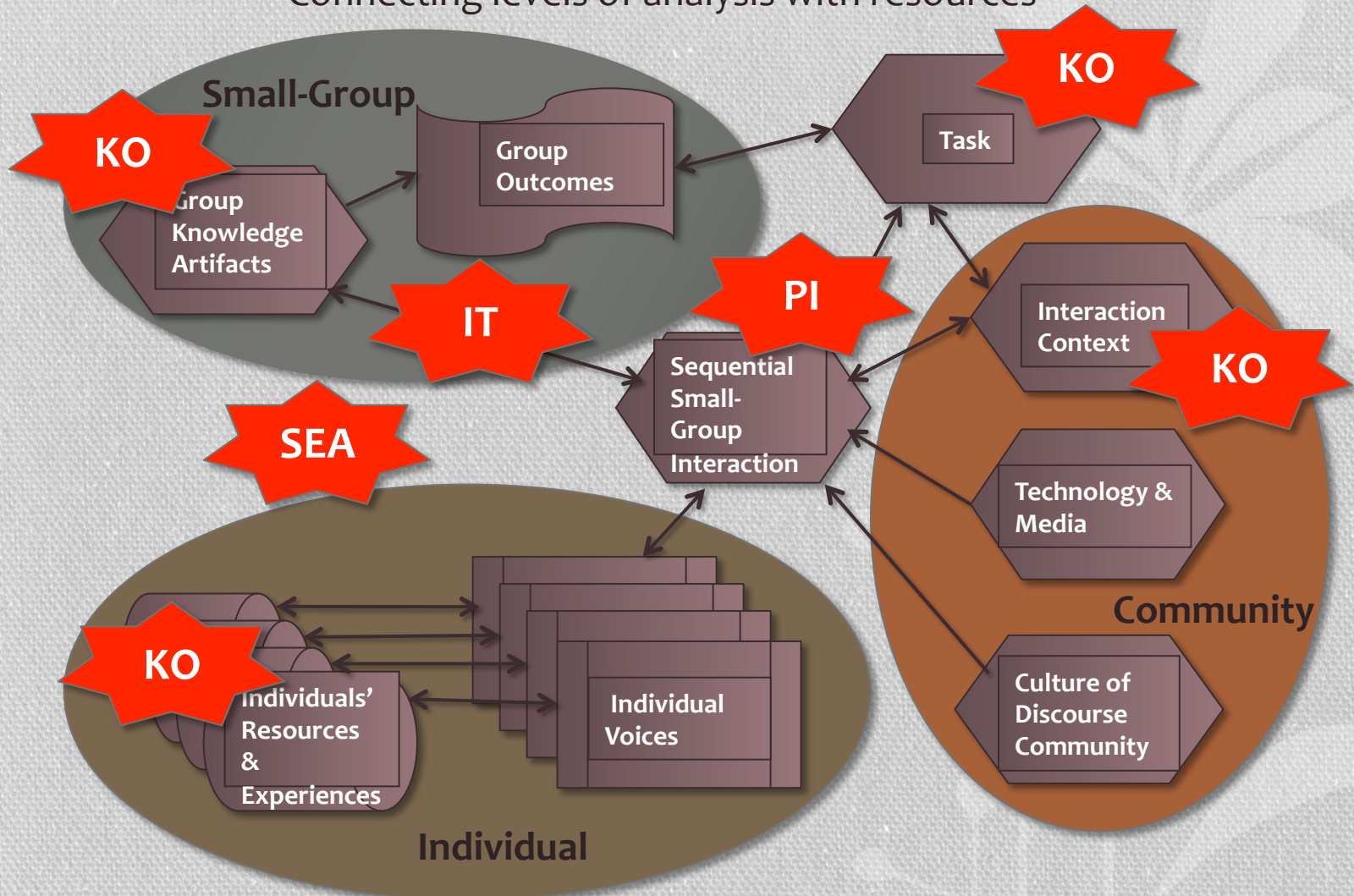
- This has the structure of a simple subject-object relationship between a mind and the world:
- Vygotsky introduced the artifact, which mediated consciousness:
- Engeström added the socio-cultural dimension from Marx (community, rules, division of labor):
- But this still lacks the individual-group connection of agency & interaction, and the temporal dimension of trajectory, as well as the multiple roles of the knowledge object as starting point, resource, mediating artifact, evolving product.







## Connecting levels of analysis with resources



The sequential small-group interaction brings in resources from the individual, small-group and community planes and involves them in shared meaning-making. This requires co-attention to the resources and thereby shares them. The process results in generating new or modified resources, which are then retained at the various planes. The resources often take the form of designed physical artifacts and sedimented (frozen) language.

# Refining theory through interaction analysis

- **What is going on in the following interaction?**
  - Can we see productive interaction?**
  - Can we see shared epistemic agency?**
  - Can we see co-construction of a shared knowledge object?**
  - Can we see an interaction trajectory?**

**Does this data give us new insight into any of these theoretical concepts?**

*Excerpt 3. Group D's discussion (5th project week)*

1. Alice: "... Shall we try to organize our ideas about feedback, what we talked about before... some terms and definitions we need to understand so we know what we want to investigate... let's get the questions.
2. Elly: ...oh, yes, the project plan, let's get that document with the questions we already formulated.
3. Elly: What do we call feedback?
4. Jane: Let's first see..., what is feedback for us, and what is feedback in the VLC.
5. Alice: Shall we just look what we wrote about that in the plan? [...]
6. Jane: So, we can indicate here that feedback can be given in different ways and that we focus on peer-feedback, suggestions for improvement and rating from peers.
7. Elly: Yes, then we can elaborate. Let's write that down. (Typing)
8. Elly: Ok, what is feedback?
9. Alice: Feedback is... how is it defined in those sources?
10. Elly: I don't have them, but I remember... linking back the results of the collaboration.
11. Jane: We must first write the definition of feedback.
12. Elly: But don't forget we focus on peer-feedback. 4-re-framing focus
13. Alice: But linking back the results of collaboration is too vague...
14. Jane: The reaction, ... or response than...?
15. Alice: Yes, response, it is response on a..., you could say, product, from a peer?
16. Elly: ... inside de VLC...
17. Jane: Yes, don't make it too complicated. Suggestions for improvement for the product in VLC by peers.
18. Alice: OK. (Typing) ..."

### 3. The dissertation as a knowledge object

- A. **Productive interaction:** Crina's interactions at Oslo, K-P Lab, Netherlands, Rutgers, etc.
- B. **Shared epistemic agency:** Part of the research effort, esp. Nordic socio-cultural
- C. **Interaction trajectory:** Design-based research iterations, paper/dissertation drafts, schooling
- D. **Shared knowledge objects:** The dissertation – including the 4 papers and earlier drafts.

## A. Productive interaction

“The point of departure for this dissertation was that we learn and we build our knowledge together with others. It is a social process in which people, ideas, resources, and context all play a role. I believe the work that went into this dissertation is a very good illustration of this assertion. It builds upon a great collection of scientific ideas, resources and traditions, and it is the result of inspiring and enriching interactions with diverse individuals and communities.” (Acknowledgements)



## **A. Productive interaction**

**The author's efforts and interactions were aimed at producing a knowledge object that would become part of the CSCL research literature.**

**Early drafts and papers served as resources for continuing productive interactions.**

## **B. Shared epistemic agency**

**The Department of Education at Oslo is structured to guide and support doctoral students to produce dissertation knowledge objects.**

**The author was trained in conducting research leading to publishable objects.**

**Groups she interacted with were also structured and experienced in co-constructing knowledge objects.**

## **C. Interaction trajectory**

**The research trajectory is often hidden in research presentation objects.**

**However, this one explicitly discusses the design-based research trajectory of its research involving the 4 experiments.**

**Much of the evolution of knowledge is necessarily hidden when the current state of knowledge is frozen in an object.**

## **D. Shared knowledge objects**

**The dissertation and 4 papers, shared with the research community**

**What are the preconditions (agency) for the community to understand this knowledge?**

- **Understanding of the cited (Nordic socio-cultural and socio-linguistic) leading-edge literature**
- **Follow the dissertation argument and details of the papers**
- **Able to use it in co-constructing one's own knowledge objects**

**A problem with the dissertation form as based on four publications. While it is trendy to base a dissertation on publications and it adds a level of peer review, it also distorts the presentation of the dissertation as a coherent, evolving knowledge object. The four publications are somehow fixed, having been written at different times and no longer open to adaptation to growing ideas. The papers were originally conceived as specific segments of the dissertation, but the publications may have been pushed in different directions by peer reviews, while the dissertation project moved in another way. In addition, the four presentations are necessarily highly redundant with material in each other and in the non-published parts of the dissertation. Textual knowledge objects have specific forms and it is not necessarily true that the form of a good journal article is also the form of a good dissertation section.**

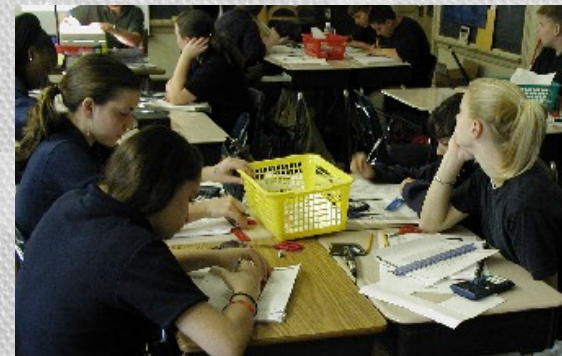
## 4. Contributions to my personal perspective

- A. **Productive interaction:** discourse that contributes to co-constructing knowledge object
- B. **Shared epistemic agency:** the capacity of a small group to engage in co-constructing knowledge objects
- C. **Interaction trajectory:** Developing agency, defining task, constituting group, understanding task, bringing in resources, problem solving, recognizing end, summarizing
- D. **Shared knowledge objects:** starting task situation, resources, mediators (tools, media, mentors, language), evolving knowledge product

## 5. Integrating the model with VMT

- A. **Productive interaction:** focus on interaction excerpts that co-construct knowledge objects
- B. **Shared epistemic agency:** focus on supporting group's collaboration capacity
- C. **Interaction trajectory:** focus on changes over time in capacity and construction ... and how the group enacts those changes
- D. **Shared knowledge objects:** focus on many roles of knowledge objects in the process


# A. Productive interaction



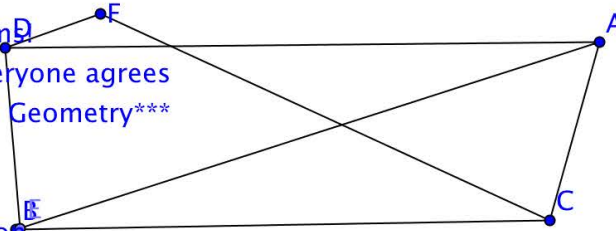
Material: Add a tab +

|         |            |         |          |              |              |
|---------|------------|---------|----------|--------------|--------------|
| Welcome | Hints Help | Objects | Dragging | Constructing | Dependencies |
|---------|------------|---------|----------|--------------|--------------|

File Edit View Options Tools Window Help



 **Move Graphics View**  
Drag graphics view or one axis (Shift + Drag)

Welcome to GeoGebra for Virtual Math Team  
Collaborate -- Take turns -- Make sure everyone agrees  
\*\*\*Explore Points and Segments in Dynamic Geometry\*\*\*



1. Use chat to decide who will do each step.
2. Someone click on the 'Take Control' button.
3. Click on the button for the Point tool at the top.
4. Now click a couple places to create a point.
5. Release control. Let someone else take control.
6. Click on the Move tool arrow on the left.
7. With this Move tool, click on a point.
8. Someone select the next tool, the Line Segment Tool.
9. Click on two existing Points or two other places -- to construct a line Segment between the points.
10. Switch back to the Move tool to drag the Segment.
11. Everyone explore these tools in the tool bar.
12. Chat about what you notice.

**When you are finished working together in one tab, move to the next. Try to finish all the tabs.**

 Take Control | nobody has control |  Move Graphics View

Current users:

Chat: (0)

**cornflakes** 2/15/13 3:28:27 PM EST chat about whatr we njotice?

**cheerios** 2/15/13 3:28:41 PM EST well its a very interesting shape

■■■■■■■

**cheerios** 2/15/13 3:29:03 PM EST a rectangle and a triangle thats mushed together

**cornflakes** 2/15/13 3:29:10 PM EST its like a polygon

**cornflakes** 2/15/13 3:29:14 PM EST right?

■■■■■

**cheerios** 2/15/13 3:29:22 PM EST it has 6 sides

■

**fruitloops** 2/15/13 3:29:34 PM EST how do i make it smaller?

**cornflakes** 2/15/13 3:29:38 PM EST no curved edges cause its made of a line segment and line segments are lines and lines that dont have curves

**cheerios** 2/15/13 3:29:40 PM EST and obtuse and acute angles no right angles

■■

**cornflakes** 2/15/13 3:29:57 PM EST yuppies no right angles

**fruitloops** 2/15/13 3:29:58 PM EST should we move on?

Message:

cornflakes is typing



## B. Shared epistemic agency

|            |                                   |
|------------|-----------------------------------|
| cheerios   | yeah so we are on #3              |
| cornflakes | ok someoen else take control      |
| fruitloops | [fully erased the chat message]   |
| fruitloops | someone take control              |
| cheerios   | whats happening?                  |
| fruitloops | idk                               |
| cheerios   | [fully erased the chat message]   |
| cheerios   | i am so lost                      |
| fruitloops | i took control. what should i do? |
| cornflakes | make a line                       |
| cheerios   | i am not sure #3 i guess?         |
| cornflakes | no i already did 3, do 5          |
| fruitloops | okay now what?                    |

before and after

|            |  |
|------------|--|
| fruitloops | lets start with quad abcd  |
| fruitloops | in the upper lefthand corner   |
| cornflakes | ok   |
| fruitloops | okay so for poly 1 all the points can move anywhere and i dont think they have resrictions |
| cheerios   | label it by saying its points  |
| cornflakes | ok   |
| fruitloops | so i think this was constructed by just making four points and using a polygon tool        |
| fruitloops | you guys can try moving if youd like   |
| cornflakes | yeah your right i dont think theres any restrictions                                       |
| cheerios   | can i try  |
| cheerios   | there are no restrictions like you said  |
| fruitloops | so do you agree with how i think it was constructed  |
| cornflakes | yes  |
| fruitloops | okay good  |

# C. Interaction trajectory

|            |  |
|------------|--|
| cheerios   | we have to explain what we did   |
| cornflakes | [fully erased the chat message]  |
| cheerios   | so first u have to plot a random point on the triangle we used k . then i realised the distance from kg is the same as im and rh   |
| cheerios   | then you have to use the compass tool in are case are the length of are radius is kg so then we clicked those 2 points and used vertex i as the center the way to plot are second point of are triangle is where the circle and segment ih intersect |
| cornflakes | right  |
| cheerios   | and then we repeated that step with the other side and h was the center  |
| cornflakes | yes you had to make the point between the circles  |
| cheerios   | not between the circles where the segment intersect with the circle  |
| fruitloops | [fully erased the chat message]  |
| cornflakes | yea same thing   |

|            |   |
|------------|---|
| fruitloops | do how do we create a square like the outer square?     |
| cheerios   | we have to talk about the dependencies and stuff        |
| cheerios   | read the instructions                                   |
| fruitloops | how but how do we make the square?                      |
| fruitloops | [fully erased the chat message]                         |
| fruitloops | like i know how to make the triangle but now the square |
| cheerios   | a grid  |
| cornflakes | olets start by cinstucting a regular square             |

|            |  |
|------------|--|
| fruitloops | now we need to use the compass tool lilke we did in the triangles tab              |
| fruitloops | because af is equal to ec and dh and bc  |
| cheerios   | then used to polygon tool and then hid the circles and lines                       |
| fruitloops | correct  |
| fruitloops | and we used the circles to make the sides equal because the sides are their radius |

# D. Shared knowledge objects

Material: Add a tab

|         |            |         |          |              |              |
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# D. Shared knowledge objects

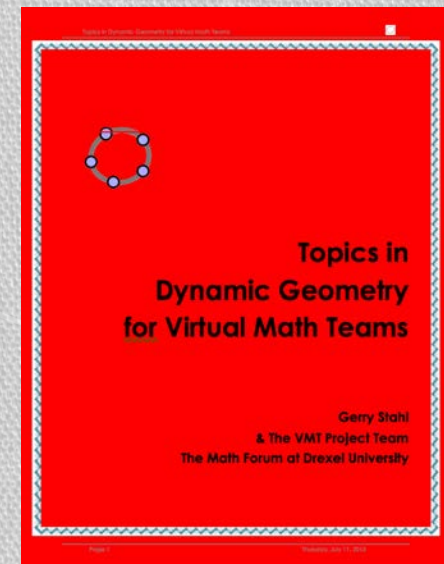
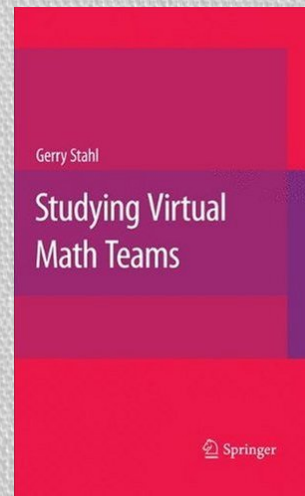
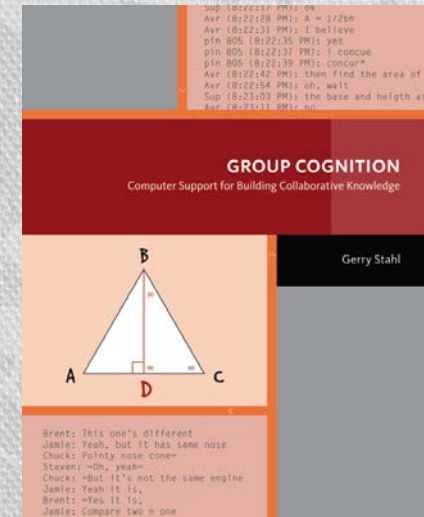
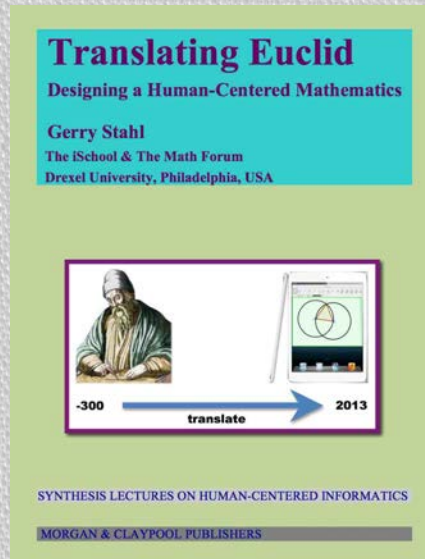
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## E. Methodology & Pedagogy

- **Design-based research** – because inquiry is iterative and you do not even know the question at first
- **Cases & excerpts** – because each case is unique and you need to understand it in some detail
- **Interaction analysis** – because discourse is essentially sequential and coding/stats throws out the important
- **Group unit of analysis** – because co-construction is there; capture all the group interaction
- **Small group & no one else** – because peers understand each other best, they need to build on each other semantically, the object has to be shared – let them struggle; no division of knowledge work

## **6. Knowledge challenges now**

### **A. Productive interaction:**

- **How does interaction take place through discourse mechanisms and semantic resources?**
- **How do groups become more productive in their discourse?**
- **How does discourse get sedimented or frozen in knowledge objects? How can this be supported or facilitated?**

## **6. Knowledge challenges now**

### **B. Shared epistemic agency:**

- **Can we see the growth of agency in interaction analyses?**
- **How does group agency relate to individual agency?**
- **How can we facilitate and support development of shared epistemic agency?**

## 6. Knowledge challenges now

### C. Interaction trajectory:

- **How can we collect complete data for productive interaction over longer time periods?**
- **Are there typical trajectories of productive interaction?**
- **How do groups construct and understand their trajectories?**



## 6. Knowledge challenges now

### D. Shared knowledge objects:

- How are these related to artifacts (Activity Theory), tools (Heidegger), instruments (Rabardel), inscriptions (Latour), resources (Stahl), etc.?
- In what ways and senses are they “shared”?
- What are the different roles they can play in productive interaction and how are these roles connected?

# The future for Crina Damsa



*For further info...*

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