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Teaming and Doing Math Problem-Solving Online

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Purpose of Analysis: Desperately Seeking...

- Empirically informed theoretical understanding of **how learners** :
  - **interact with technology** enhanced learning environments
  - **relate to each other and instructors** in technology enhanced learning environments

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Theoretical Framework

- To what extent are cognitive architectures culturally relative?

- CSCL Environments as Socio-Technical Systems that involve:
  - Interacting with Computers
  - Interacting with Others

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Concept 1: Appropriation of Affordances

- Affordances are **action-taking possibilities** and **meaning-making opportunities** in an actor-environment system with reference to the competencies of the actor and the capabilities of the system.

- Appropriation of Affordances refers to the intentional utilization of affordances

- Cultural variation in the appropriation of affordances as a key methodological strategy to understanding the core phenomenon

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Concept 2: Technological Intersubjectivity

- Social consequences of connectivity augured by information and communication technologies

- Refers to the emergence, formation, and sustenance of an **interactional socio-technical relationship** between online participants
  - Psychological Intersubjectivity: Functional
  - Phenomenological Intersubjectivity: Experiential

  - Cultural variation in the structures and functions of technological intersubjectivity

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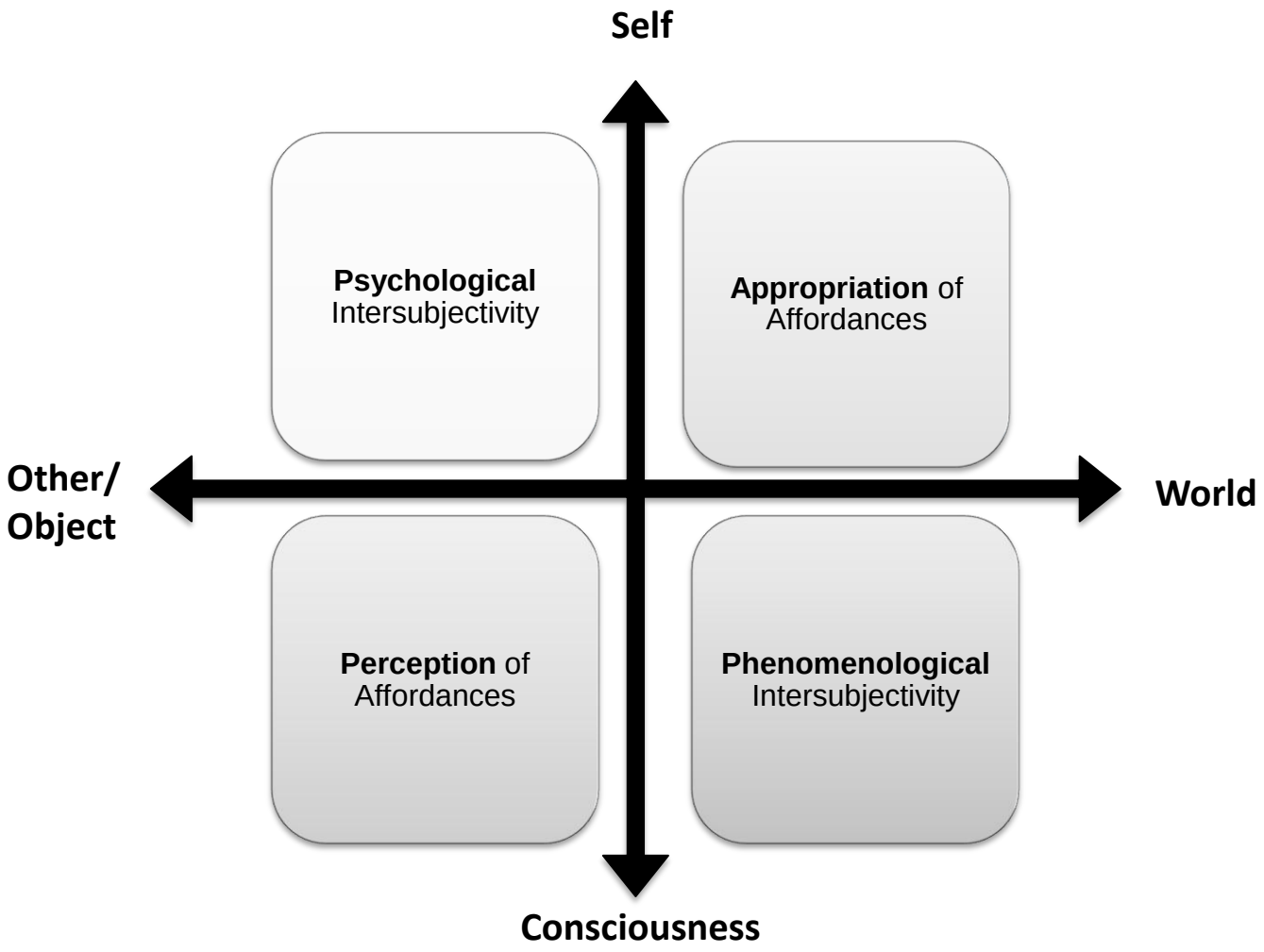
Four Aspects of Analysis



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Units of Interaction

- Perception of Affordances (PoA)
  - Pointing, graphical referencing, and deictic referencing as “poor person’s eye-tracker”
  - Need for instrumentation

- Appropriation of Affordances (AoA)
  - Externalized Action
  - Individual as the **Focus of Interaction**
  - Human-Computer Interface as the **Locus of Interaction**

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Data Record

- Record of Individual's PoA and AoA
  - Documentation of the reality and actuality of perception and appropriation
  - Individual screen recordings + local material artifacts
  - **Learning Scene Investigation** (**LSI**): Need to document that an event has indeed taken place and show how the actors accomplished it.

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Data Representations & Transformations

- XML Logs→ Excel Tables (queries, filters, counts)
- Screen Recording (scrubbing, marking, segmenting)
- Contingency Graphs

(significant q-value: Sequential structure of temporally unfolding interaction)

- Suthers et al's Uptake Graphs (UG)
  - A socio-biological reading of information uptake
  - Representing multi-valued configurational data on actors and actants in the UG

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Data Record: What's Missing

- NO individual screen recordings
- NO client-side server logs
- Server logs are not adequate for analyzing PoA (Global vs. Local tension in EM/CA)
- Server logs are barely adequate for analyzing AoA
- Are there artifacts missing from the Local Learning Scene? (paper…)

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A few observations

- Doing Math “horizontally vs. vertically”
- Doing Math in the classroom vs. chatroom vs. studyroom
- Changing social configurations (team,moderators)
- Differential participation (Quality & Quantity)
- Moderator effects
- Idiosyncratic aspects of interaction:
  - Individuals
  - Group configuration
  - Socio-Technical environment

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A few observations

- Real world does barge in (chat line 17)

17	05/09/2006	18:25:36	18:25:44	Jason	chat	ooh we just did this in math class about a week ago! :)

19	05/09/2006	18:25:49	18:25:55	Jason	chat	well, not the exact thing, but sequences and series

- Quasi-Experimental: “Demand Characteristics”
- Differing Competencies

126	05/09/2006	18:44:28	18:45:11	ssjnish	chat	just to clarify sumthing, i am not overwhelmingly good at math as u guys seem to be, so it may take me more time than u guys to understand sumthing..

- “X has fully erased the chat message”: Reasons?
  - Interactional purposes already met ?
  - Performance anxiety?

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Implications for Design

- System capabilities for existing sketching competencies of the learners
  - Wacom Tablet integrated with the whiteboard and/or Touch Screen monitors
  - Built-in Math equation editor
  - Tabbed whiteboard; whiteboard wiki
- Explore the role of voice chat besides textual chat
- Explore integrating local cognitive aides such as graph paper into VMT