Technology-Supported Learning Innovation in Cultural Contexts

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Introduction: Two Phenomena to Be Explained

- Technologies as an agent of change (Girod & Cavanaugh, 2001; Price & Oliver, 2007); Then why "domesticated technologies (Salomon & Almog, 1998) ? "

- "Lethal mutation" of innovations (Brown & Campione, 1996): New classroom activities and procedures are regarded as the means to enabling deep change in the learning culture. But often times, there is no deep change evident after the proposed learning activities have been carried out. Why?

A Core Issue

- How should we conceptualize a learning culture and the nature of its change?

Reflecting on the Reductionist Approach to Learning and Technology Research

- Two cases:
  - Media effects
  - Technology in educational change

- A reductionist, analytic approach: Deep learning goals and target learning cultures are reduced to a list of things to do and to use: tasks, activities, procedures, resources, tools, etc.

Towards a Complex System Perspective of Learning Culture

- *Emergence*: the way system-level properties arise out of multiple, relatively simple interactions among the component parts (O'Connor, 1994).

- The micro-macro dynamics:
  - *supervenient causations* refer to the bottom-up emergence of more complex, "'higher level' level" properties from the organization and interaction of simpler, "'lower level' level" component parts;
  - *downward causations* represent the significant influence of the overall system organization on the function of any component (Kim, 2006; Sawyer, 2003).

Learning Culture as a Complex System

- Characterize learning cultures: beliefs, power structures, knowledge content, learning strategies and activities, etc. (e.g., Bielaczyc, 2006; Little, 1990; Tweed & Lehman, 2002).
  - Macro-level properties characterizing a learning culture as a whole;
  - Specific, micro-level characteristics associated with particular components

Macro-Level Properties

- Epistemologies-in-practice
- Social values applied to learning and education
- Power structures: Power distance (Hofstede, 1983)

Micro-Level Properties

- What kinds of knowledge *content* is taught and how is it organized and sequenced?
- What kinds of learning *strategies and activities* are conducted?
- What *technologies* are used?
- How is the *classroom* spatially organized?

Micro-Macro Dynamics

- *Supervenient causations*: The evolution of the macro properties is the result of the interactions among components. It cannot be fully predicted or deducted.
- Downward causal influences of the macro properties on components
  - Domesticated technologies (Salomon & Almog, 1998)
  - Incorporate procedures and activities (e.g., cooperative learning) into existing structures
- *Multiple realizability* of a complex system

Macro-Properties of the Eastern Learning Culture

- Epistemologies: A more authoritative view of knowledge and learning (Jin & Cortazzi, 1998; Pratt & Wong, 1999; Tweed & Lehman, 2002)
  - Treat texts and the instructor as highly authoritative sources of knowledge
  - Learn first, question/criticize later
  - Effortful, reflective learning
- Social value: Collectivism; a pragmatic orientation to learning
- Accept larger power distance (Bond & Hwang, 1990).

Downwards Causations of the Macro-Level Properties on Technology Use

- Hong Kong had a much higher ratio of schools with digital projectors or LCD display boards than many Western countries (Law, Yuen, Ki, Li, & Lee, 1999).
- Distance learning localized as group-based distance lecturing (see also, Tu & Twu, 2002; Zhu, Gu, & Wang, 2003).
- 85 % the learners: it is important to study in a classroom together with their classmates (Zhang, Wu, & Li, 2003).

Educators' efforts to build deep connections between new technologies and ongoing educational practices in their local contexts, fostering the historical descending of their learning culture.

Working with the Macro-Micro Dynamics to Enable Deep Change

- Implementing new component activities and technologies may not necessarily enable deep change in macro-level, core properties of the learning culture—the governing epistemological beliefs, social values, and power structures.
- Directly work with these core cultural properties.
- Principled innovation: teachers design and re-design their classroom processes in light of the thumb principles, instead of simply implementing the provided classroom activities and technological tools.

Knowledge Building: 12 principles

- Macro-level: epistemologies, social values, and power structure
  - *Improvable ideas, collective responsibility for community knowledge, epistemic agency*
- Micro-level principles
  - *authentic problems and real ideas, knowledge building discourse, constructive uses of authoritative sources, embedded and transformative assessment*

Can teachers productively work with the core principles and develop effective designs?

- Sustained improvement of knowledge building practice at ICS (Zhang & Scardamalia, 2007).
- ART analyses of the past years at the SI.
- How?

Deepening Understanding of Principles and Evolving Designs

- *Epistemic agency*
  - Deepen their understanding of what this principle really means and what level of agency can be enabled among a particular group of children.
  - Experiment with strategies to turn over more control to students.
  - Reflective observations: " *My soul gets constantly amazed by what these young children can accomplish...*"
  - These observations increase their trust in student agency, and help them to envision new possibilities.

Identifying and Overcoming Barriers to Implementing the Principles in Specific Contexts

- Teachers need to understand the contexts, reflect on the barriers, and develop effective strategies accordingly.
  - Eastern students often expect the teacher to provide more guidance and structure, and give more weight to external, social value of learning (Tweed & Lehman, 2002).
  - Teachers in Hong Kong experimented with culturally adaptive strategies: more structures, use of a participation score; awards.

Reflecting on key classroom issues in light of the principles

- The teachers monitor and reflect on their classroom processes in light of the knowledge building principles:
  - Are there idea improvements evident in conversations?
  - Are students enacting collective responsibility for community knowledge?
  - How can a teacher intervene in the knowledge building process without compromising students' epistemic agency?

Reflecting on key classroom issues in light of the principles

- A teacher in Toronto
  - Students showed resistance to using Knowledge Form.
  - Reflection: students had been asked to use Knowledge Forum too much for things that were not necessary, for example, to write down factual information instead of important ideas.
  - *"So we have to really be careful of how we use the technology that is not for the sake of technology. It has to be for the sake of knowledge building. Some knowledge building happens in KB talks, some happens in notebooks, and some happens there [in Knowledge Forum]."*

Conclusions and Implications

- Macro-micro dynamics
- The macro-level properties of an existing culture have significant downward causations to the component features.
- The downward causations explain
  - why new technologies are assimilated into ongoing practice without causing deep change; and
  - why new classroom activities and materials provided by reformers are often ritualized as surface procedures in classroom.

Conclusions and Implications

- Deep and sustainable innovations need to address challenges associated with both the micro- and the macro-level.
- Endorse teachers' efforts to deepen the underlying principles, evolve new designs in their contexts, and engage in deep reflections across these two levels.

Thank you!

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