Virtual Math Teams (VMT): Continuity and Sustainability of Collaborative Knowledge Building

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Virtual Math Teams (VMT):
The VMT project is an NSF-funded research program that investigates the dynamics of group cognition and the innovative use of online collaborative environments to support effective K-12 mathematics learning.

Challenges for Group Cognition:
- Knowledge building is distributed across the members of a group and the resources they create and use through their interaction
- Knowledge building is distributed across multiple groups
- Knowledge building is distributed across time and across multiple episodes of joint activity

How do online groups overcome these gaps?

How do they bridge "synchronic" aspects of their collaborative knowledge building (i.e. single episode interactions) and its "diachronic" evolution across time?

The VMT Online Environment:
- Support for rich synchronous interaction
- Support for persistent local representations of knowledge
- Support for social awareness and social interactions
- Support for bridging across time and across collectivities
- Support for research with complete, interactive records

Preliminary Findings:
- Groups overcome the challenges for their distributed cognition using:
  1. a wide range of socially-shared "methods" for interacting.
  2. Groups deploy these methods with various degrees of success.
  3. This has noticeable effects on the reach of their knowledge building activity.
- The synergy between "synchronic" knowledge building (single episode interactions) and its "diachronic" evolution (across time and across collectivities) relies on:
  1. Construction of a group problem space, in which resources can be actively referenced.
  2. Collective remembering: the ability of a group to base current activity on prior joint action.
  3. Bridging across the work of multiple groups to reconsider, extend, and project other's work and to create boundary-crossing artifacts.
- Three aspects of the socio-technical system can support the interplay between diachronic and synchronic interactions, leading to successful knowledge building:
  1. the affordances of the online environment.
  2. the sequences of activities offered for participation, and
  3. the interactional engagement of the participants.

Case Study: Trajectories of Knowledge Building
Fifteen teams of 3-5 participants
Upper middle school & high school students
Invited teachers selected participating students
Groups mixed across schools in 5 different states
Team configuration varied across sessions
Four one-hour online sessions in 2 weeks
Light facilitation and feedback between sessions
Anonymous participation
Open-ended, creative task, partially self-regulated
Data: Re-play of Chat and Whiteboard actions
Method: Qualitative Interaction/Chat Analysis

Synchronous Problem Space
Diachronic Problem Space

Principal Investigators: Gerry Stahl, Stephen Weimar, Wesley Shumar
Guest Researchers: Elizabeth Charles, Jan-Willem Strijbos, Stefan Trausen-Matu.
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Doctoral Students: Murat Cakir, Johann Sarmiento, Ramon Toledo, Nan Zhou

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