Mechanisms of Peer Tutoring on Optimizing Cognitive Load during Knowledge Sharing in Learning Networks

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About the title…

• **Context**: Learning Networks (LN)s
• **Learning activity**: Knowledge sharing
• **Theory for learning arrangements**: Cognitive load theory (CLT)
• **Solution**: Peer tutoring (PT)
Non-formal learning & Learning Networks

Learning Networks (LNs) are “a particular kind of online, social network that is designed to support non-formal learning in a particular domain” (Sloep, 2009, p.64).
Why knowledge sharing?

• Non-formal learners have the needs as formal learners.
• However, their learning needs are more diverse than formal learners. → Tutor overload
• Turn to their peers for knowledge sharing.
Why cognitive load theory (CLT)?

• CLT is to inform the design of instruction and instructional materials (Paas, Renkl, & Sweller, 2003).

• Human cognitive architecture (Sweller, van Merrienboer, & Paas, 1998)

• “To be effective, instruction should be designed in alignment with learners’ cognitive architecture” (Van Gog, & Paas, 2008).
Three types of cognitive load

• Intrinsic load: number of interactive information elements.
• Extraneous load (↓)
• Germane load (↑)

They are imposed by the design of instruction/learning material.
Extraneous load during knowledge sharing-1

Heterogeneous group composition in LNs

Participants do not know each other.

Participants do not have common learning history.

How to find a knowledge sharer?
Extraneous load during knowledge sharing-2

Online communication:
Some features of face-to-face communication are missing to a larger or smaller extent.

- Synchronous: extra planning
- Asynchronous: putting thoughts into written texts
When working on a complex task...

- A complex task
- High intrinsic load
- Extraneous load
- Needs knowledge sharing

- How to find a suitable knowledge sharer?
- How to communicate online?

The total cognitive load has detrimental effects on learning effectiveness and efficiency.
Using **technology-enhanced** form of peer tutoring (PT) to optimize cognitive load

- What is peer tutoring (PT)?
- Topping, 1992, p.322:
  - “People from *similar* social groupings who are not professional teachers, helping each other to learn, and learning themselves by teaching”.
Three mechanisms of technology-enhanced form of PT

1. Peer tutor selection (Van Rosmalen et al., 2008)
2. Role specifications
3. Interaction structures
Peer tutor selection

An automatic peer tutor selection system finds suitable tutors for me: L1, L10, L6 are selected.

Extraneous load is decreased: No extra effort is invested on finding people process.

Selection criteria:
- Content competency
- Tutor competency
- Eligibility
- Availability

The selection criteria make sure that the most suitable peer tutors are found.

The most suitable peer tutors can transmit their knowledge to tutees better than the others.

This implies more germane load is induced.
Role specifications

• Assigning roles

• Role tasks
An example of role tasks
Interaction structures

• The interaction structure of PT to support knowledge sharing should assist the communication and the collaboration process.

• Using a wiki as an interaction structure: wiki is an editable website that allows people to work collaboratively.
Research question

• Can the support structure of peer tutoring reduce extraneous load when learners share knowledge on complex tasks?