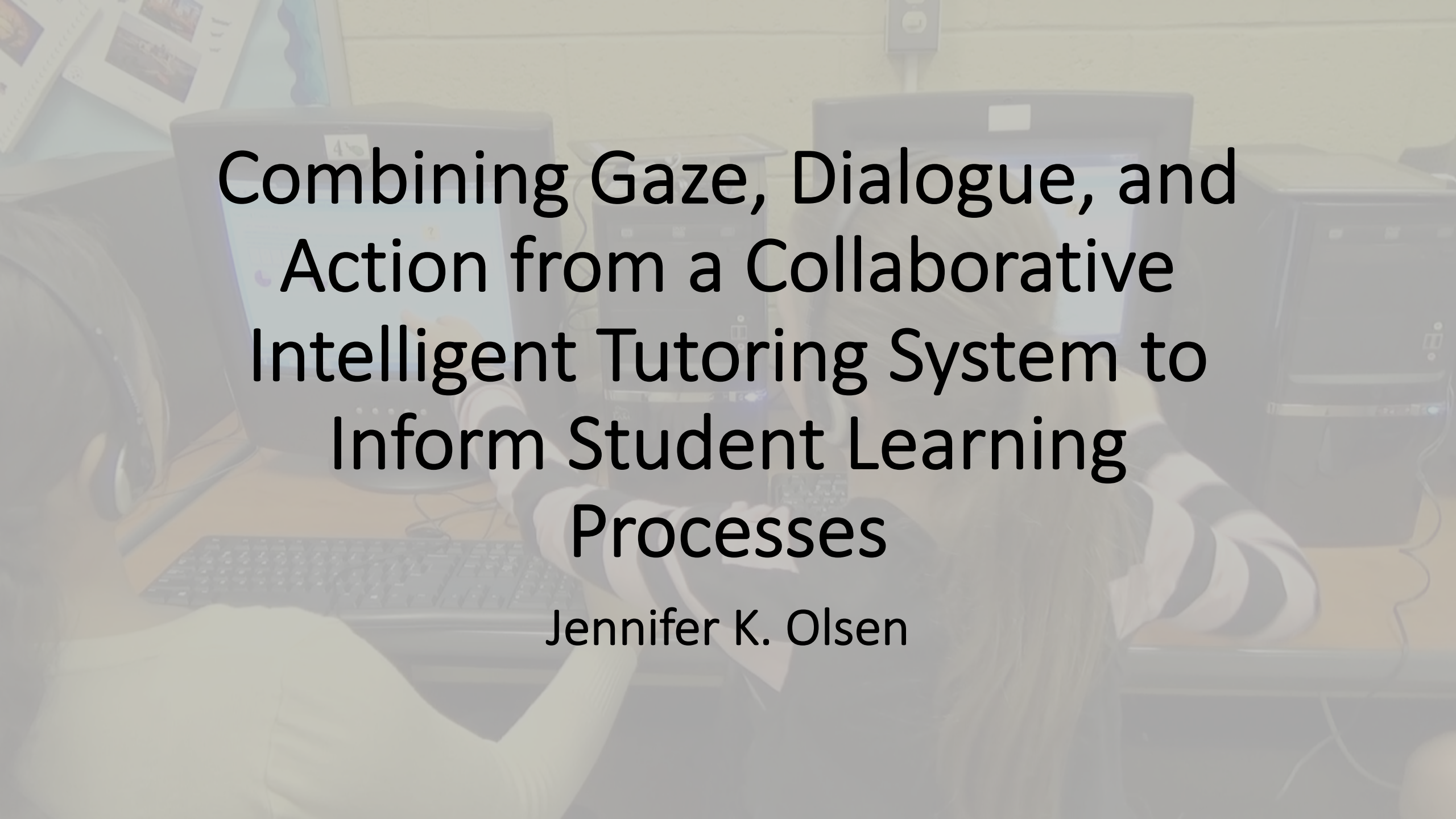


Combining Gaze, Dialogue, and Action from a Collaborative Intelligent Tutoring System to Inform Student Learning Processes

Jennifer K. Olsen

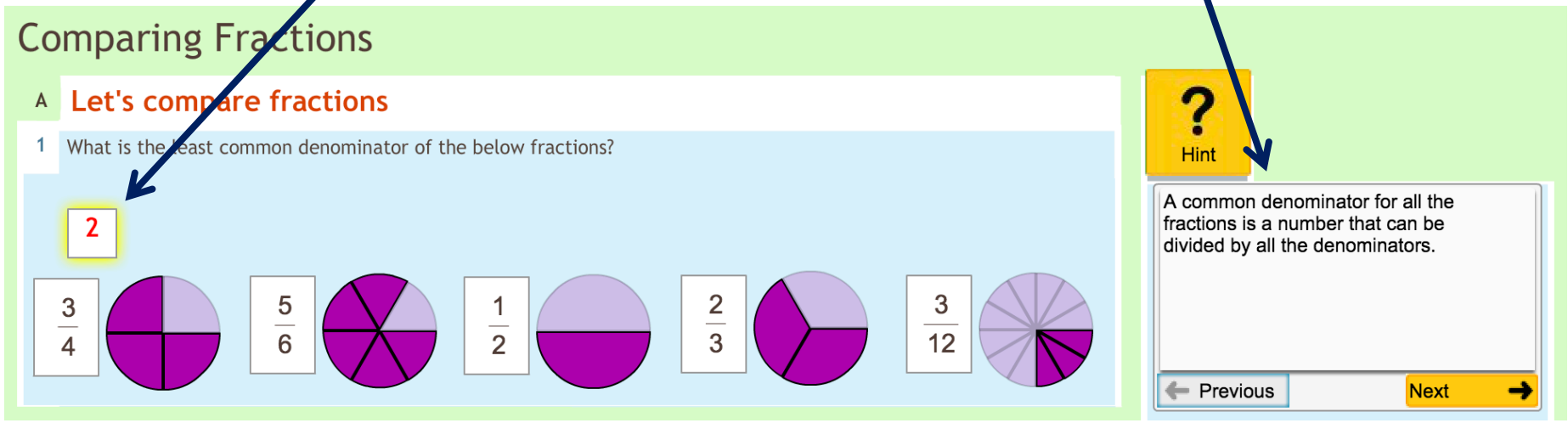
Adaptation and Personalization in Education

- Content
- Materials/Activities
- Feedback
- Difficulty

Technology Platform: Intelligent Tutoring Systems (ITS)

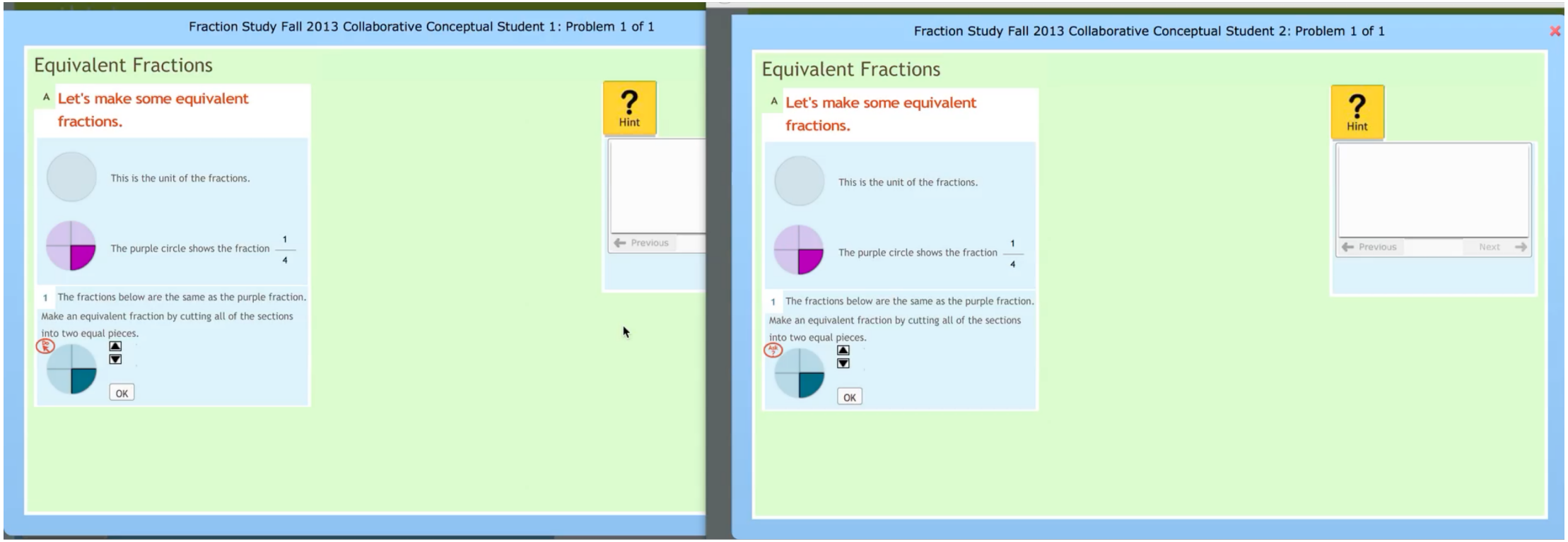
Immediate feedback

On demand hints



Multiple Social Levels in the Classroom

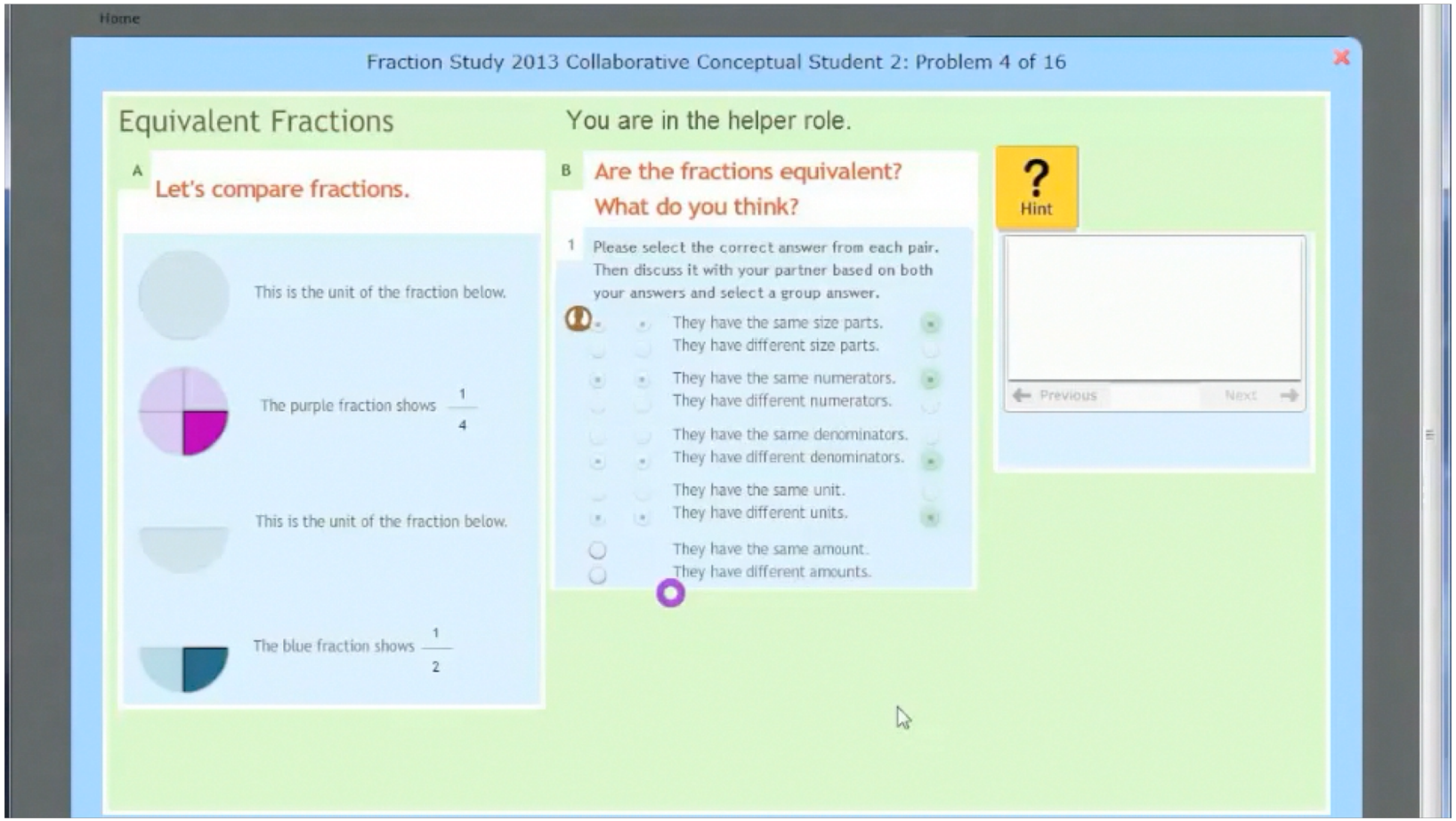
Effective Support for Collaborative Learning



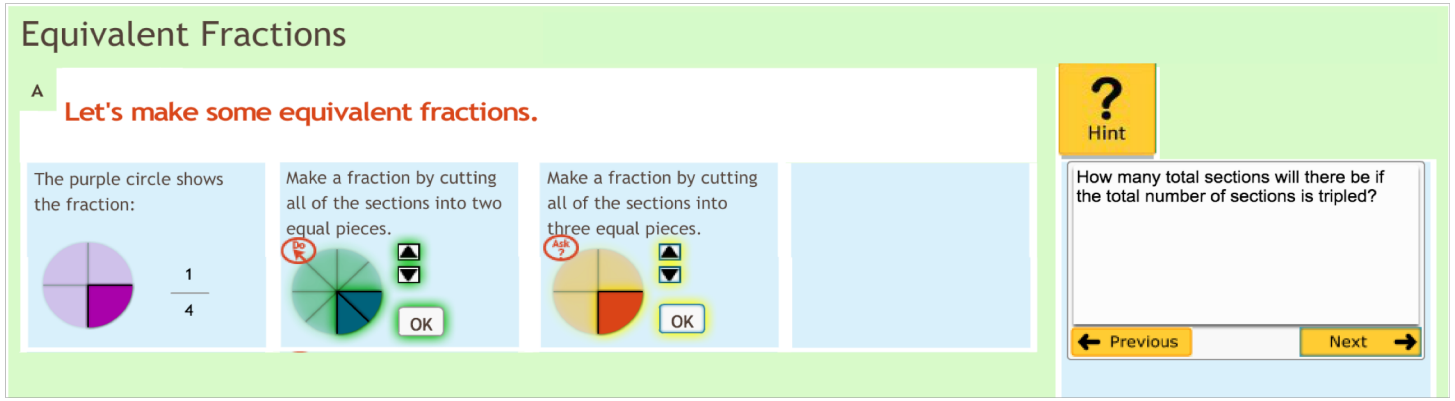
Olsen, Belenky, Aleven, & Rummel, 2014; Olsen, Aleven, & Rummel, 2015; Olsen, Rummel, & Aleven, 2016

Engaging with the system and each other

What can eye-tracking tell us about collaboration?



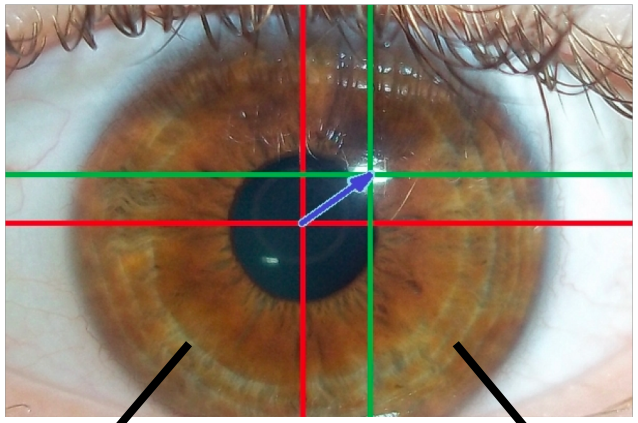
What is the relation between eye gaze and other process data collected during the learning process?

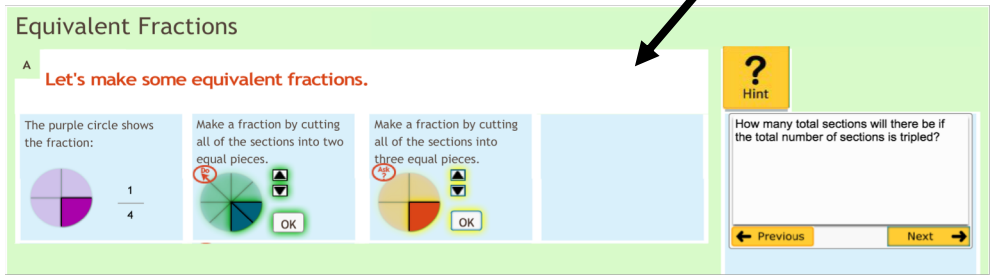


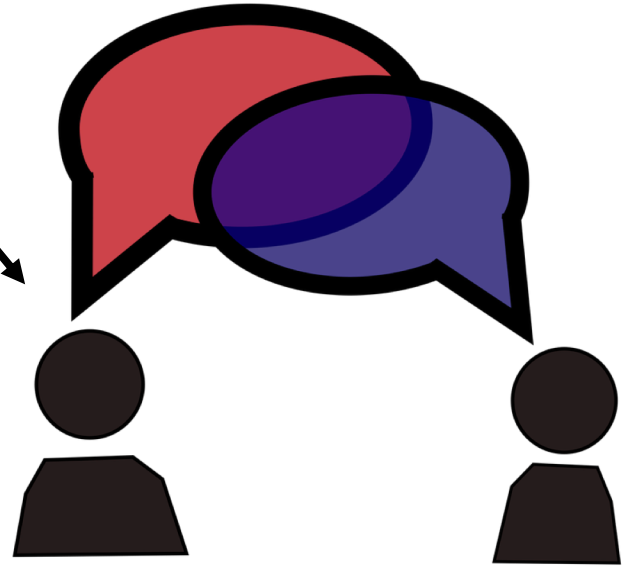
- 84 4th and 5th grade students, 26 collaborating pairs
- Students either worked on conceptually oriented problems or procedurally oriented problems, randomly assigned to condition
- Pull-out study
  - Sitting across the room communicating through Skype

Olsen, Sharma, Rummel, & Aleven, 2018

Comparing Data Streams





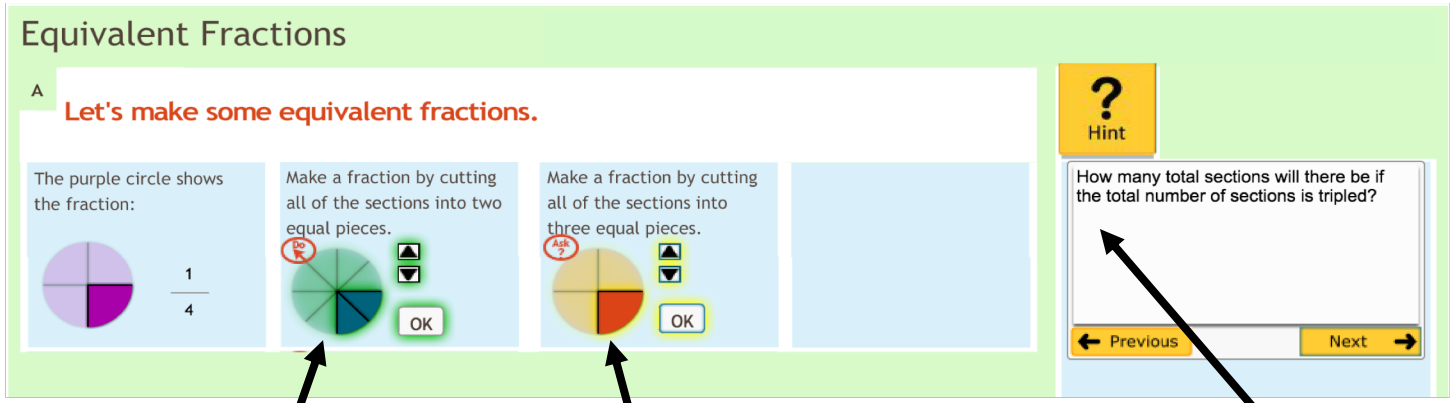


Dialogue

Code	Description
Not Applicable	The student engages in off-task behavior, converses with the experimenter, or vocalizations without any context.
Acknowledgments	The student acknowledges their partner, or they request acknowledgment or a repeat of what the partner has said.
Read Out Loud	The student is reading information provided within the problem and presented on the screen.
Interface	The student discusses actions that can be taken in the interface or engage in work coordination.
Problem Solving	The student is providing an answer to the problem or showing evidence of think aloud as they solve the problem.
Concepts	The student is adding information from outside of the problem or providing an explanation that goes beyond the required answer.
Metacognitive	The student verbally expressing their understanding of their current knowledge/problem solving state.

Kappa= 0.78

Tutor Response



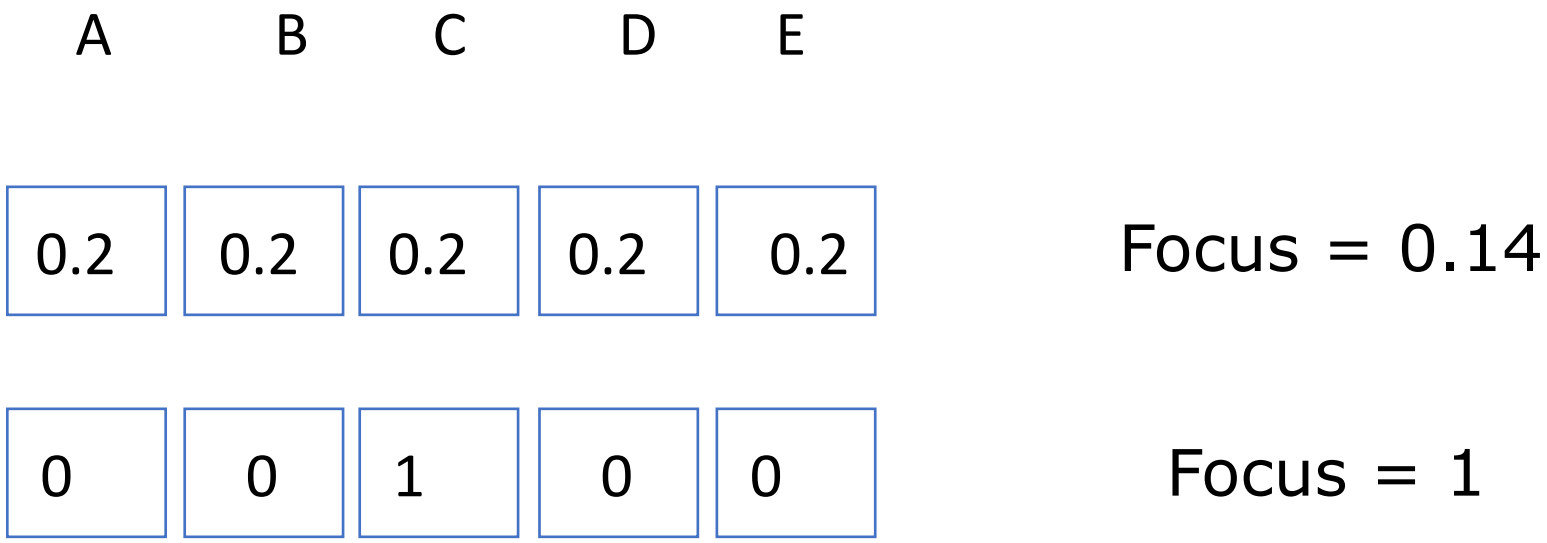
Correct Feedback

Hint or Incorrect Feedback

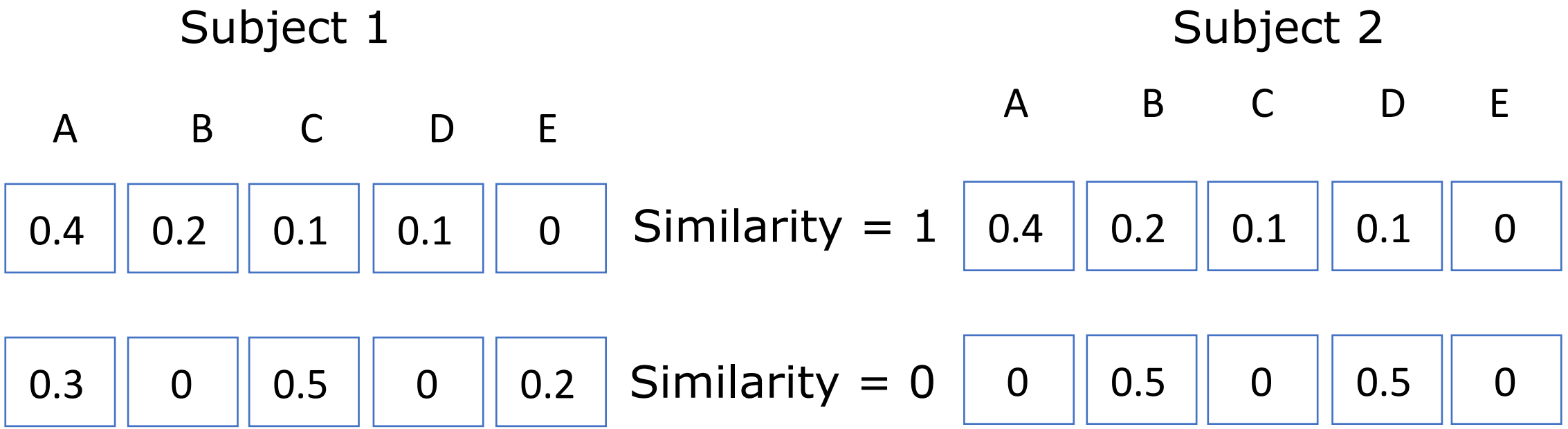
Hints

Eye Gaze: Focus (Individual)

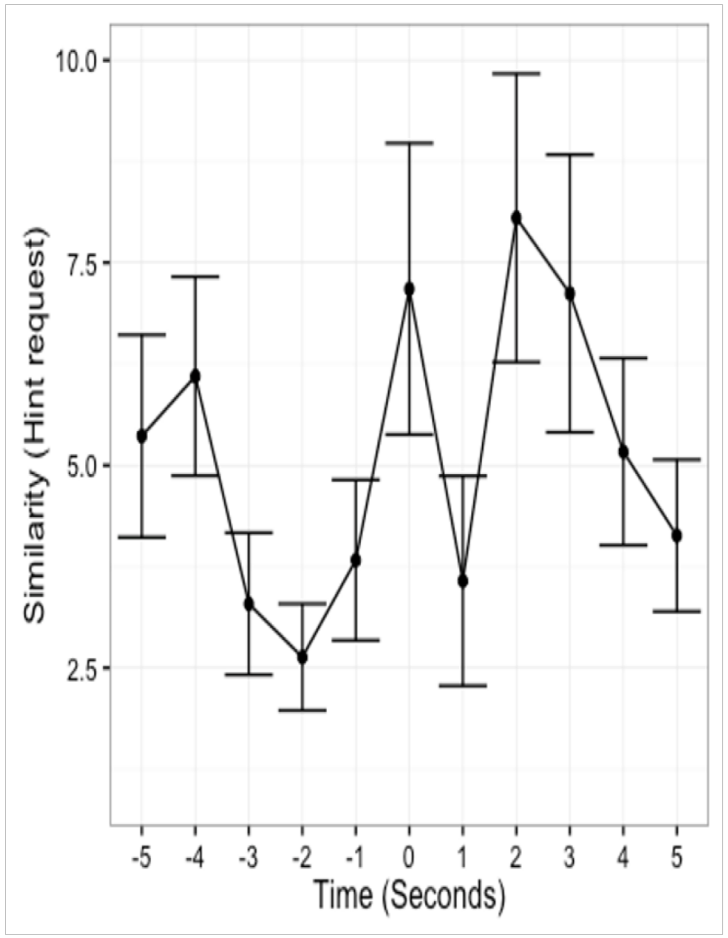
Focus = inverse entropy

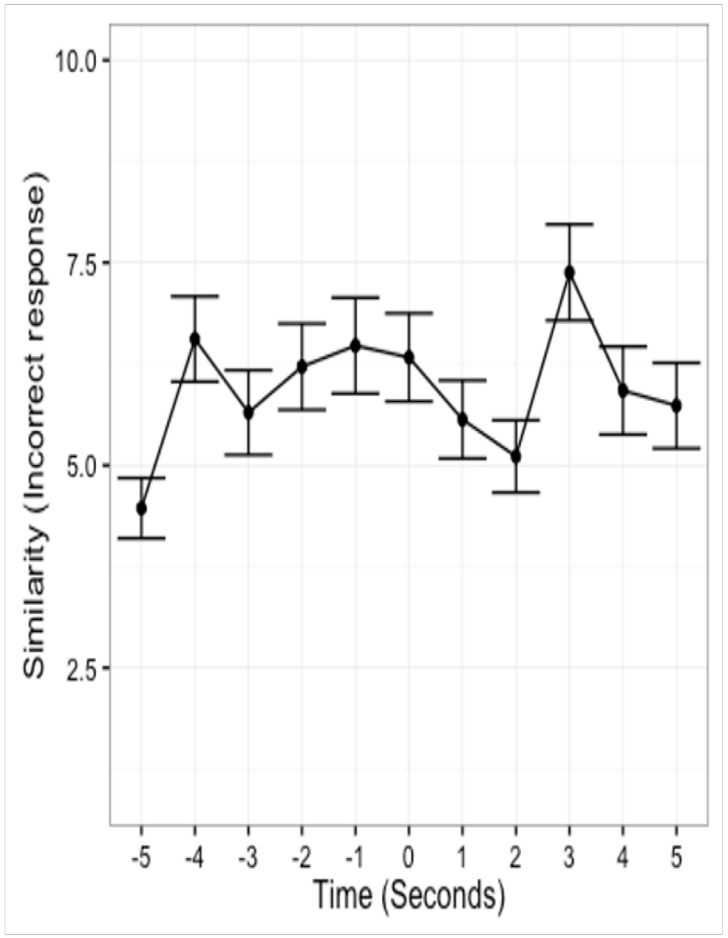


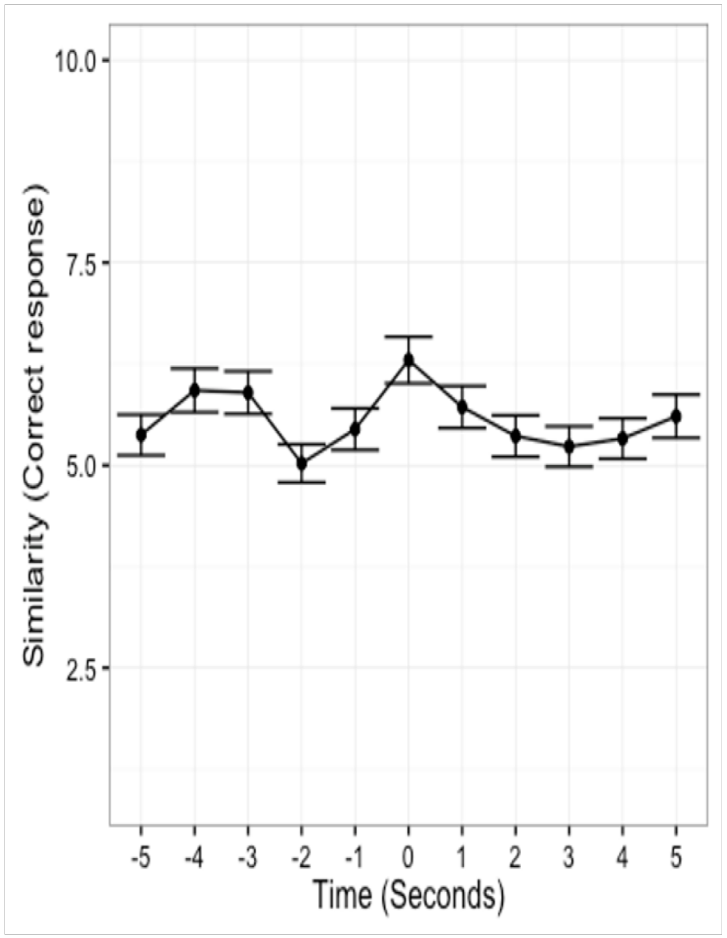
Eye Gaze: Similarity (Collaborative)



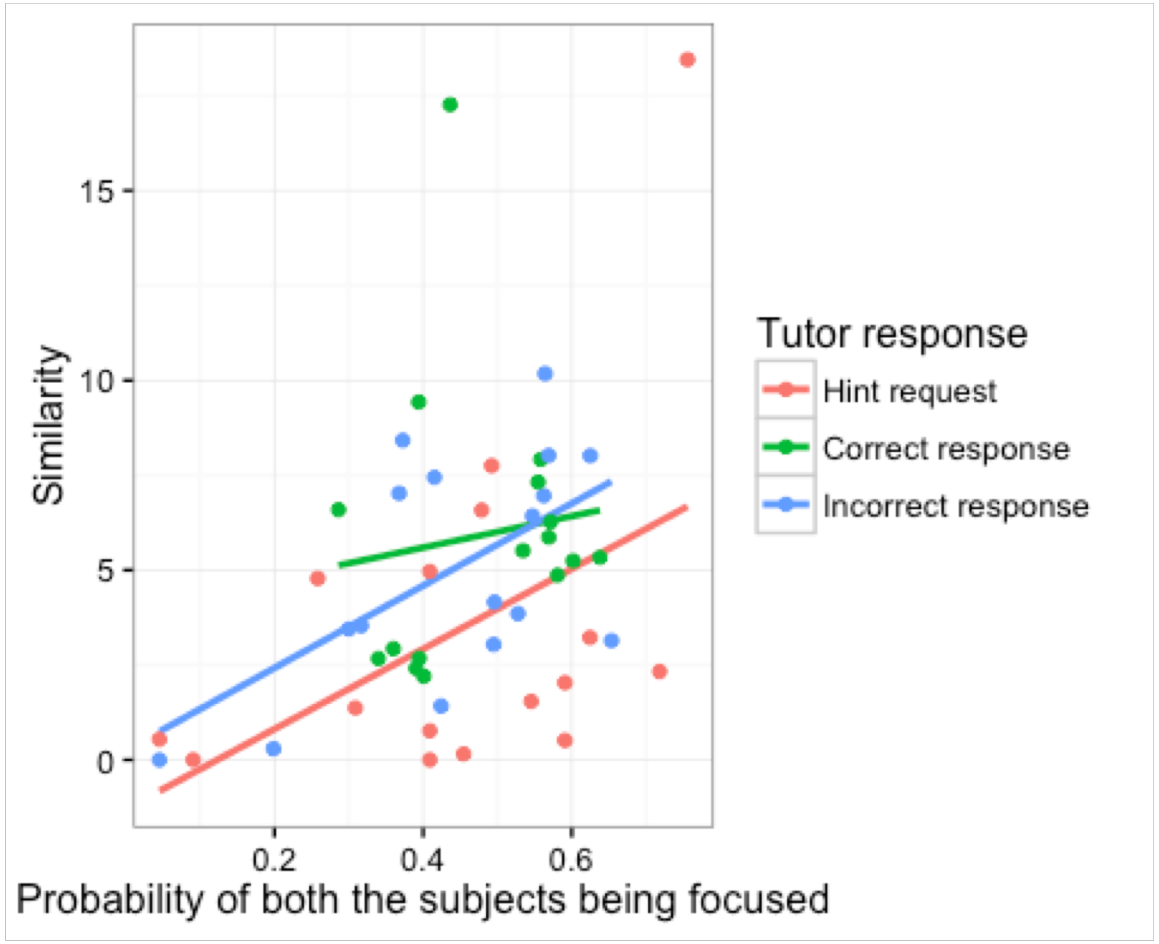
Similarity and Tutor Actions



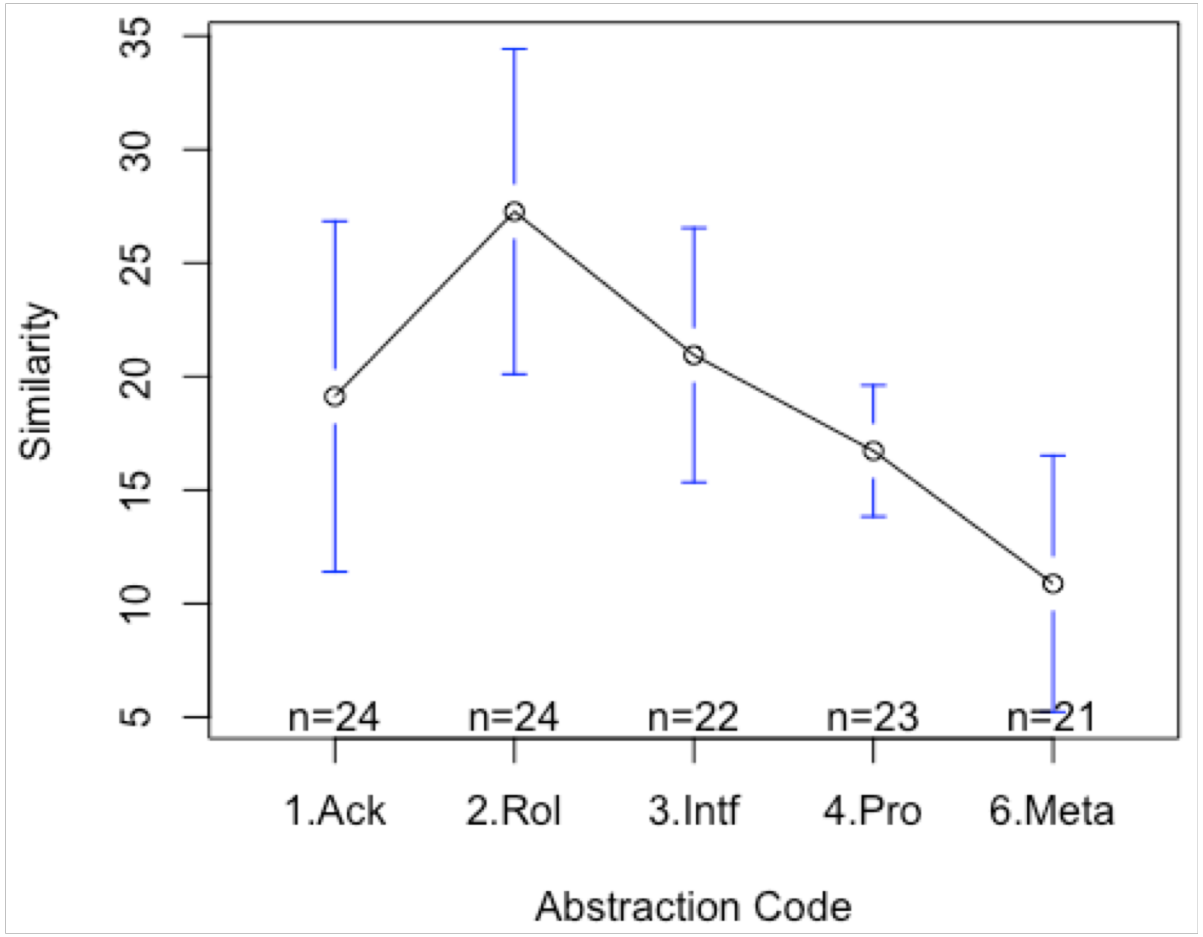




Similarity and Focus Around Tutor Actions



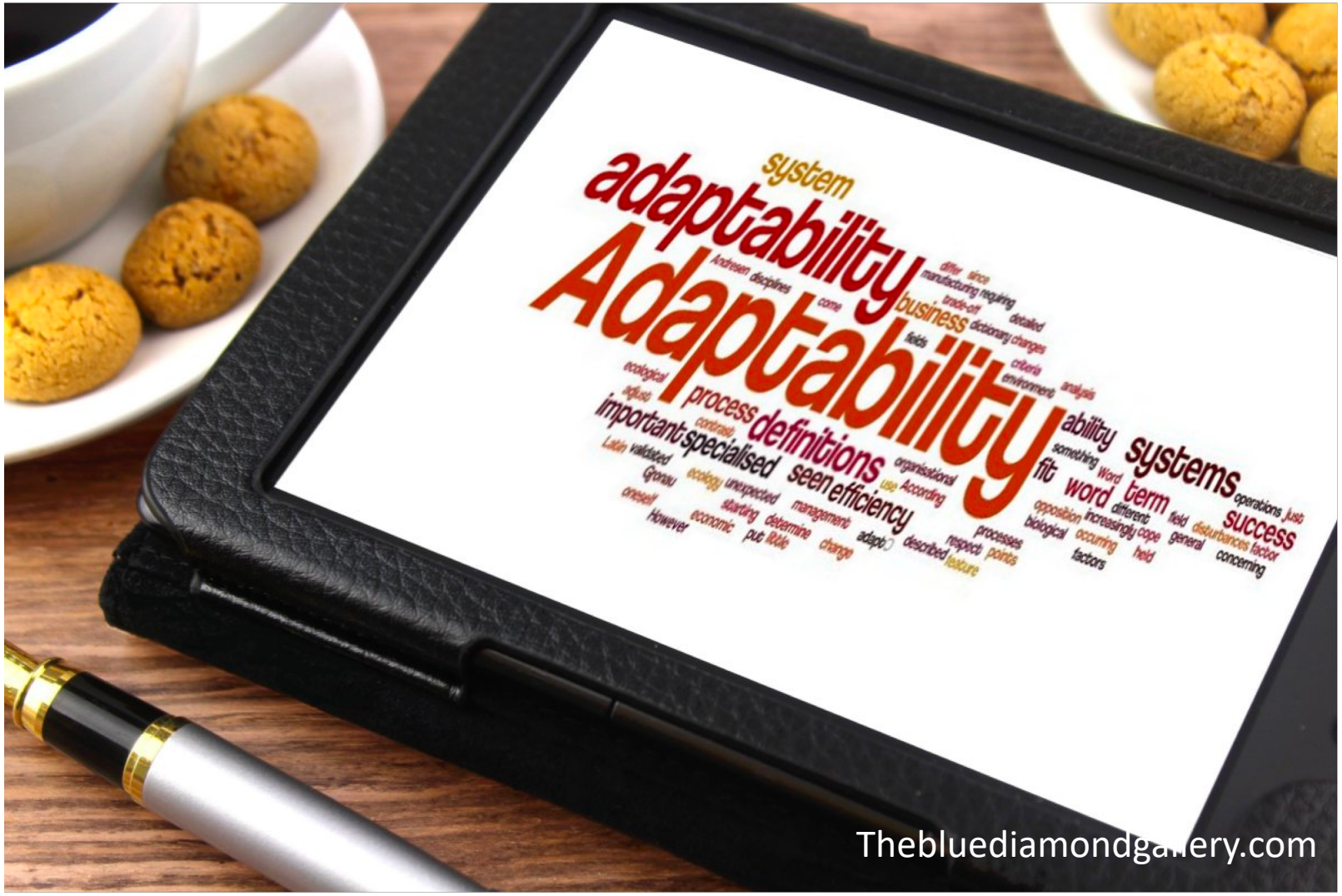
Similarity and Abstraction



Take-aways

- More gaze similarity after something has gone wrong
- More gaze similarity around more grounded speech
- Counting collaboration actions on their own may not be enough

What do we do with this?



Thank you

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