Patterns of (In)equitable Collaboration in Elementary Computer Science: What they Look Like and Why they Emerge

Niral Shah
Department of Teacher Education
Michigan State University
niral@msu.edu
My Research Program

- Equity in STEM
  - Mathematics
    - Race/Racialization
  - Computer Science
    - Multiple Discourses (e.g., gender, “smartness”, race)
    - Collaborative Learning
Acknowledgments

Prof. Colleen Lewis
Harvey Mudd College

Student Researchers: Roxane Caires, Nasar Khan, Amirah Qureshi

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Overview of Presentation

• Defining “equity”

• Two mixed methods comparative case studies
  – Study #1: The nature of (in)equity in collaborative learning contexts
  – Study #2: How (in)equity relates to students’ emergent orientations towards the task
Defining “Equity” in Learning Contexts

• Equity & equality: access to resources
  – Equity: *fairness*
  – Equality: *sameness*

• Equity ↔ learning opportunities
  – Student engagement and access to identities (Cohen & Lotan, 1995; Esmonde, 2009; Nasir & Hand, 2008; Wortham, 2006)
  – Access to the conversational floor (Engle, Langer-Osuna, & McKinney de Royston, 2014; Erickson, 2005; Lemke, 1990)
## Research Context

- **Introductory Computer Science summer program** *(Shah, et al., 2013)*
  - 12 days x 3 hours = 36 hours of instruction
- **Participants**
  - 22 rising 6th grade students
  - 50-50 male/female; high SES; mostly White and Asian

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<tr>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
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<tbody>
<tr>
<td></td>
<td>Pair Programming</td>
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<td>FINAL PROJECT OPEN HOUSE</td>
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Research Context

• Self-paced, online curriculum
Data Collection & Focal Students

• Data Sources
  – Primary: audio recordings of collaborations
  – Secondary: Field notes, student work (written & digital)

• Focal Student: “Jason”
Jason + 4 Partners (90 min interactions each)
Analytic Approach

• Focus on talk (Barron, 2003; Engle & Conant, 2002; Langer-Osuna, 2011)

• Quantitative analysis:
  – Distribution of turns

• Qualitative analysis:
  – Recurring types of interactions
  – Particular discursive moves
Guiding Question

*At minimum*, what would be true about the distribution of talk in an equitable collaboration?
Tool for Measuring Equitable Collaboration

**Overall Talk**
- Total Number of Turns

**Participation Structure**
- Pair Programming
- Switch Driver/Navigator every 5 minutes

**Activity**
- Coding
- Designing
- Logistics

**Discursive Move**
- Commands
- Questions

**Equity Benchmark**
- Jason: 50% / Partner: 50%

When Jason navigating:
- Jason: 65% / Partner: 35%
  vs.
- When Jason driving:
  Jason: 35% / Partner: 65%

When Jason navigating:
- Jason: 65% / Partner: 35%
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Study #1: *How did (In)equality Emerge?*

- **Aaron (Day 4)**
- **Samantha (Day 6)**
- **Kim (Day 8)**
- **Peter (Day 10)**
Quantitative Patterns in Aaron-Jason & Samantha-Jason: % of *Jason’s* Talk

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Aaron Commands, Jason Clarifies

Jason: So what next?
Aaron: When “d” key pressed.
Jason: “d”...what?
Aaron: Control tab.
Jason: Oh...here?
Jason: Just press “d”?  
Aaron: Don’t just press “d,” go to the Control tab.
Aaron: “When Space Key Pressed” [block]...do you see that?
Aaron: Space key pressed.
Jason: This?
Aaron: Yeah, drag it out.
Aaron: Change it to “d.”
Impact on Opportunities to Learn

“I don't remember how to do it, [because] when we did—well I didn't do it, Aaron did. I was there but I didn't really…”

- Jason (lines 287-288)
Samantha-Jason: Reciprocity
Samantha-Jason: Reciprocity

Samantha: Oh, oh and then it picks a random seconds and it shows the star.
Samantha: You get it? And then it shows the star...
Jason: Wait, do you want to get a third one?
Samantha: Yeah. So what do you want as a power-up?
Jason: What do you think is good?
Jason: One that says [incomprehensible]
Jason: Alright...what, what, what do you want to get it from?
Samantha: Probably not plants.
Jason: “Fantasy,” “Things”...
Samantha: Just “Things.”
Jason: Or, alright, just “Things.”
Jason: Then we’ve got bananas, baseball...
Study #1: Main Takeaways

Aaron-Jason: Master Chef & Sous Chef

Samantha-Jason: Partner Chefs
Study #1: Main Takeaways

Equity/inequity are **Contextual Phenomena**

Study #2: How did (In)equity Emerge?

Jason

Aaron (Day 4)
Samantha (Day 6)
Kim (Day 8)
Peter (Day 10)
## Quantitative Patterns Across All 4 Pairs

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What was different in the interactions across these pairings, and why did those differences emerge?
Hypotheses to Consider

- Prior Friendships with Samantha & Kim
- Individual Beliefs about:
  - Collaboration and “pair programming”
  - How to treat a lower performing partner
- Sociohistorical Group Membership
  - Gender
  - Race
- Students’ Orientations
A Tale of Two Orientations

Jason-AARON

Jason-SAMANTHA

Jason-KIM

Jason-PETER

Task Completion

A Commitment to Speed
Speed Orientation: Jason/Aaron

• Taking shortcuts
  – Aaron uses Microsoft Paint vs. actually writing code (lines 106-145)

• Aaron wanting to work on his own final project
  – ”I'm trying to make a football for you so we can work on my project” – Aaron (line 447)
Speed Orientation: Jason/Peter

• Competitiveness: comparing progress with other classmates (lines 556-563)
  – “Wait, you guys finished already?!” – Jason

• Competitiveness: with each other
  – Comparing last night’s homework (lines 50-56)
  – Comparing final projects (lines 174-184)
Absence of a Speed Orientation:
Jason/Samantha & Jason/Kim

• Playfulness
  – Testing the “Tag” Game w/Samantha
    (lines 412—478)

• Command-clarify-and-explain
  – Debugging w/Kim (lines 1-26)
Study #2: Summary of Findings

<table>
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<th>Predominant Interactional Routines</th>
<th>Predominant Orientation</th>
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<td>Jason/Aaron Jason/Peter</td>
<td>Taking Shortcuts Competition</td>
</tr>
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**Open Questions:**

- Why do students develop such orientations in the first place?
- What kinds of pedagogies can moderate orientations that lead to inequities?
Conclusion: Broader Theoretical Points

• Making “equity” concrete
• Equity as contextual phenomenon
• Students’ orientations ↔ Equity
Thank You!

Questions & Comments

niral@msu.edu