

# Organizing for Collective Agency: Negotiating Social and Disciplinary Risks of Collaborative Learning

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**Abstract:** Mathematical practice of collaborative problem-posing gives students agency to express their musings and follow their own lines of inquiry. Agency, however, does not come without embracing social and disciplinary risks. In this study, I trouble the ease with which the literature talks about agency in problem-posing and examine what is socially and emotionally at stake for students to do this work. Using micro-ethnographic case study approach, I investigate the interactions of a purposefully selected group of students in an eighth-grade mathematics classroom. I find that active listening and foregoing control over individual ideas to pursue collective imagining enabled students to negotiate the risks in a way that allowed them to productively engage in crafting a meaningful math problem. Using the findings, I conceptualize the notion of collective agency in problem posing and discuss why nurturing collective agency is a more productive and ethical goal for inquiry-based collaborative learning environments.

Sociocultural views of learning identify agency as a “transformative capacity” (Giddens, 1979, p. 88) taking form through agents’ active work upon the world (through either active action or resistance) and shaped by the mediational-means (cultural tools, artifacts, language, and signs) (Engestrom, 2011a; Holland & Lave, 2009; Wertsch, 1998). In mathematics learning, agentic work takes place when students mobilize resources and take “risks to venture beyond a stipulated situation to explore and further develop a set of ideas” (Powell, 2004, p. 45). Mathematical problem-posing by the very nature of practices it invites learners to engage in—such as questioning, conjecturing, and so on—*authorize* learners to improvise, revive unresolved quandaries, reframe old problems, mathematize everyday social situations, and to undertake their mathematical agency (Armstrong, 2013; Brown & Walter, 2005; NCTM, 2000; Turner, 2003).

Agency does not, however, come without embracing fear and risks by students (Sinclair, 2004). The instructional culture in the U.S. public-schools is still to a large extent incompatible with epistemic openness and volition demanded of learners for problem-posing (McKinney & Frazier, 2008). For learners, especially minoritized learners, to truly exercise agency may mean embracing perceived risks of “local contentious struggles” (Holland & Lave, 2001) that may inappropriately outweigh the innovative capacities of their ideas and actions (Agarwal, 2019). Surpassing the traditional authority of teachers and textbooks, expressing an uncertainty, or sharing emergent ideas with others may mean getting positioned as disruptive or negotiating one’s social position (Esmonde, 2009; Philip, Olivares-Pasillas, & Rocha, 2016; Warren & Roseberry, 2011).

This study aims to trouble the ease with which the literature talks about student agency in problem-posing and examines what is socially and disciplinarily at stake for learners to do this work. The underlying premise is that agency resides in all human beings, but it is exercised differently in different contexts with varying consequences (Engestrom, 1999b; Gresalfi, Martin, Hand, and Greeno, 2009). In particular, I ask: How do groups of students negotiate the perceived risks of local contentious struggles *in situ* and perform multiple mediated agencies to create a safe and productive space for collective problem-posing?

## Methods

### Study context

The study was conducted in two low-track 8th grade mathematics classes at Valley Middle School (VMS; pseudonym). The classrooms comprised all Latinx students, 37% designated ELLs, and 94% students eligible for free or reduced lunch, primarily from Spanish-speaking family backgrounds. Mr. R who taught both the classes was a white-American man in his third year of teaching non-honors 8<sup>th</sup>-grade math at VMS with 13+ years of total teaching experience.

### Task

The problem-posing tasks and participation structures were co-designed with Mr. R. The task included students getting an artifact/image (see Figure 1). Students were asked to (1) individually write what they notice and wonder about the given image (6 minutes); (2) then to share and discuss their observations and wonderings with

their group-peers (6-8 minutes); and (3) lastly, to create a math problem in their group using the wondering ideas they had just discussed (15-18 minutes).

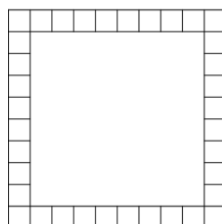


Figure 1. The 10x10 border image for problem posing.

## Data

Data comes from Mr. R's two class periods. Four groups in period 1 (n=16) and two groups in period 2 (n=8) were consented and videotaped using a flip camera and a table mic generating a total 5 video-hours of data. Additionally, teacher-provided and student-designed artifacts and written work were collected.

## Analytic approach

Leveraging what Castanheira, Green, and Yaeger (2009) describe as ethnographic logic of inquiry—I watched and re-watched each video to create detailed content logs, systematically documenting students' initial wonderings about the given image (see Table 1), when which ideas got taken up or abandoned; and shifts in ideas from nascent wonderings to the fully crafted problem (see Figure 2). I also created full transcripts of all six videos documenting utterances, cross-talk, and any obvious gestures, expressions, body movements, and tones of voice in student interactions (Ochs & Schieffelin, 1989). Lastly, I conducted interaction analysis (Erickson, 2006) to identify critical moments (Maher, 2002) of emergence of contentious struggles, their nature vis-à-vis the local group-context, and ways in which students negotiated the perceived risks of struggles and exercised their agency. Table 2 outlines the struggles that emerged.

Table 1: Initial nascent wonderings of students in Group 3

Doubt→ Student	A # of squares/ patterns	B Filling squares in the middle	C Filling shapes in the middle	D Breaking the given square
Jorge:		I wonder why the middle is empty.		I wonder if we can break this down into different shape.
Leo:	What is the total number of squares?	Can it be filled with more squares?		
Diego:	How many patterns/ squares in the image?	How many squares fit in the middle?	How many different shapes you can fit inside the square?	
Jesus:		How many squares fit in the middle?	You can't put different shapes beside a square. ( <i>Reframed by Leo: If we used something besides square would it make a difference?</i> )	

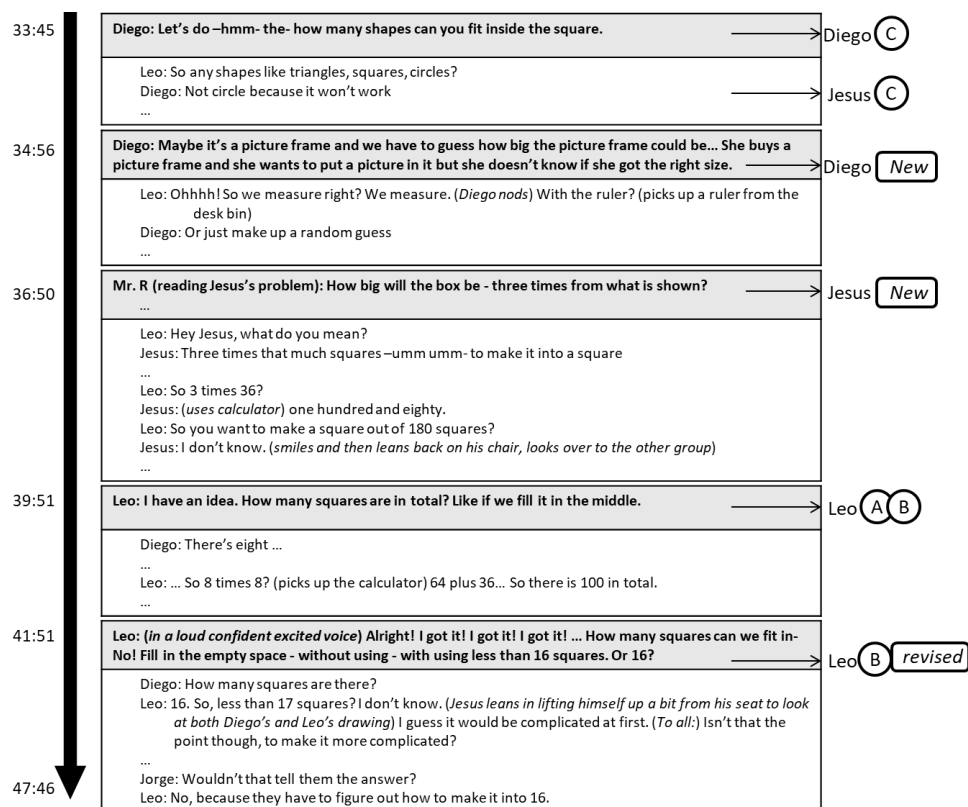


Figure 2. Tracing shifts from wonderings to the final math problem for Group 3.

Table 2: Local contentious struggles in problem-posing

<b>How to organize for problem-posing and collective activity?</b>	<ul style="list-style-type: none"> <li>• How do we share ideas with others?</li> <li>• Who will do what? Who will initiate?</li> </ul>
<b>How to make sense of the multitude of possibilities for a problem?</b>	<ul style="list-style-type: none"> <li>• How do we make sense of each other's noticing and wondering ideas?</li> <li>• Who is invited to explain and who is questioned, and by whom?</li> </ul>
<b>What does it mean to make a math problem?</b>	<ul style="list-style-type: none"> <li>• What does it mean to make a math problem?</li> <li>• Who will do what? How do we all contribute to the collective posing?</li> </ul>
<b>Which and whose problem is a good math problem?</b>	<ul style="list-style-type: none"> <li>• Whose idea should be used for the problem? Who are we making the problem for?</li> <li>• How do we decide which problem is a good math problem?</li> <li>• How do we decide which problem is a good math problem?</li> </ul>

## Case selection

By comparing and contrasting what was emerging in each group, I found that one group in particular (Group 3) negotiated the risks in a way that individual agencies of the students gave way for the emergence of collective agency and productive problem-posing. In particular, in this group, struggles were more often verbalized and acted upon using material and ideational tools, disciplinary practices, and peer interactions. A detailed analysis

of all four struggles and interactions negotiating their risks resulted in the findings I describe below, but here I present an abbreviated analysis of only one of the struggles.

## Analysis

### Struggle 1: How to organize for problem-posing and collective work

Right after Mr. R asked students to share their thoughts about the given image with others in their groups. Jorge leaned in gently towards Jesus, and Jesus and Leo both towards Diego, their gaze shifted from the teacher to the class-board and to each other. Before initiating conversations, as was asked by Mr. R (“start talking!”), Diego suggested they use the small “white board” on their desk to make their list and Leo re-confirmed what they needed to write/do. Diego re-read the task instructions from the class board out loud. While Diego was reading, others were focused on listening and reading with him. Jorge was sitting upright and his gaze moving gently from the board to Jesus to Leo to Diego. He seemed tensed from his very still body posture, somewhat passive about interacting, but at the same time he was leaned-in towards his peers signifying that he was attentive and ready to follow others. Jesus’s hands were neatly folded on the desk above his worksheet as he leaned in to listen to Diego. Jesus was fiddling with his fingers and was looking around as if impatient or anxious, but his gaze kept returning to his peers implying that he might have been waiting for others to initiate.

After reading the instruction, Diego summarized to Leo: “We are supposed to ask about *their* wonders and notice”. “Their” for Diego meant Jesus and Jorge’s; signifying that they (Diego and Leo) cannot continue working in just pairs (which was how they had naturally worked even when asked to work in groups) but will need to include others as well. Leo immediately asked Jesus: “Do you want to say your wo- umm, your notice first?” Jesus leaned forward, slightly raising himself up from his seat, picked up his worksheet, then looked at the class board as if reading the instructions again, and finally settled back down on his seat. He looked down at his sheet intently and silently but did not say anything. Diego, Leo, and Jorge patiently waited for him, their gaze fixed upon Jesus. Jesus’s silence for 20 long seconds as he fiddled with his worksheet suggested some reluctance about sharing. Soon, instead of obliging Leo by sharing, Jesus in an unsure manner asked a question: “Wait. But what are we writing on?” After they all sat in a brief silence, Diego suggested they write it on a paper. Leo voluntarily assumed the charge to write team’s shared ideas. In these subtle ways students were “entering into dialogue” (Wells, 2007, p.253) and beginning to organize themselves in relation to the task, to their peers, and the resources available to them.

### Summarizing struggle 1

Fundamentally a practice of mathematicians, problem-posing is a departure from how classroom environments allow minoritized low-tracked youth to engage in mathematics (McKinney & Frazier, 2008) and unto itself a risky endeavor. Additionally, initiating something in an unfamiliar context of a new task and with people with whom one may not yet have developed a relational trust or collaborative norms could be daunting (Boaler, 2008; Langer-Osuna, 2018; Wells, 2007). Abandoning a personal creative urge in favor of other possibilities shared by others to maintain a collective stake may not be simple either.

In the above episode, as students began the task, they were taking these social and disciplinary risks head on; as evidenced by Leo trying to realign himself to what the task is; Diego and Leo trying to initiate their dialogue with Jesus and Jorge as a group; Jesus hesitating to share; and Jorge maintaining silence and a tensed body-posture. However, we also begin to notice instances of initiatives and collective organization as evidence of students’ agency. While Mr. R had given students specific instructions about the task, students did not follow them *mindlessly*. Instead, they took up agency to first organize themselves and gain a shared understanding of what they have to do and how they will do it (i.e., writing vs. verbally sharing). This was done not only using the material and linguistic mediational means (such as Diego’s suggestion to use the desk board and Leo’s questioning about the task). It was also done using nonverbal *signs* as sociolinguistic resources.

## Findings and discussion

I discuss two claims that emerged from the analyses about the role of nonlinguistic signs. (1) Active listening and (2) Seeing one’s actions as part of a greater whole.

### Finding 1: Active listening

Active listening can be understood as learners paying attention to the nonverbal (and verbal) *signs* in their local context through listening, seeing, noticing, interpreting, and sensing. The role of *signs* in how individuals exercise their agency is not new (Wertsch, Tulvist, & Hagstrom, 1993; Wells, 2007), but the role of learners actively attending (listening) to the nonverbal signs of social peers is not something that is foregrounded in the

empirical studies of collaborative learning. The role of quiet active listening (including their noticing and sensing) is not well-understood for student inquiry and dialogue; and if anything, being quiet is seen as a form of relinquishing agency. Nonverbal signs become even more consequential in the moments of local contentious struggles. For example, Leo volunteering Jesus to first share his ideas seemed to be a sign of intimidation for Jesus. In response, Jesus' fiddling with his worksheet without speaking might have appeared to Leo as a sign of his not ready to share that made him wait for his response. A few other subtle social signs present were leaning in towards peers, tracing/ gazing the text silently while Diego re-read the instructions, leaning in without saying anything, pulling out the desk-board on peer's suggestion, and fiddling with the worksheet.

## Finding 2: Seeing one's actions as part of a greater whole

Seeing one's actions as part of a greater whole can be understood as learners foregoing control over their individual ideas or actions to pursue the calling of collective imaginations and alternate possibilities. Foregoing control means favoring, abandoning, revising, or repositioning one's own actions/ideas in ways that support collective progress by making oneself and each other accountable towards dialogic and disciplinary sense-making. Upon Leo's invitation, Jesus could have gone off-task, remained silent, skipped his turn, or challenged Leo. Instead, Jesus posed a question to deflect Leo's invitation that signifies a certain level of accountability to his peers and their collective work. Jesus's question also pushed others to document and create a shared repository (see Figure 3) of their ideas that later organized their collective work in important ways. It also gave a chance for Leo to invite his peers once again with seemingly more openness and less intimidation: "What did you guys write down, for notice?"—an invitation that Jorge promptly accepted by sharing his observations about the image. Soon everyone shared their notice and wonder list one-by-one in a synchronous effortless manner, pausing only to clarify and ask questions, and before they negotiated the other three struggles.

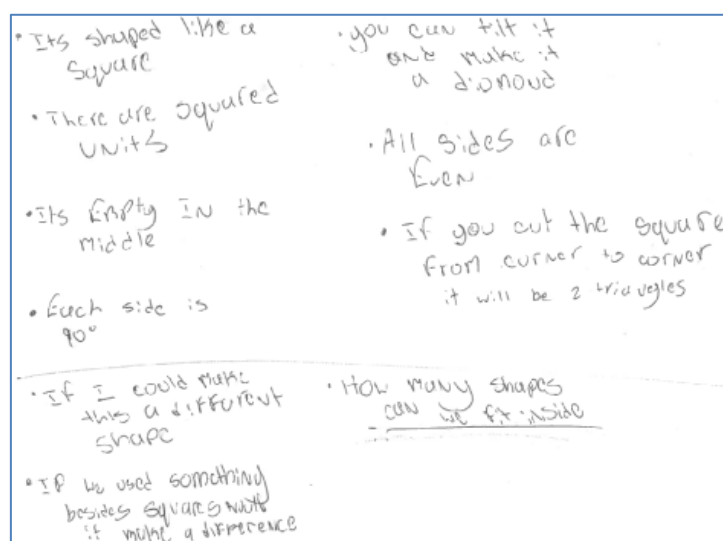


Figure 3. Student-created repository of collective ideas.

## Conclusion

By shifting their actions and restructuring the activity to negotiate local contentious struggles, students were organizing for collective agency in mathematical problem posing. This new sense of assurance in each other might have allowed students to forego fear in favor of emotional courage and to trade the feelings of frustration with those of hope in the knowledge producing process of problem posing allowing cultivation of greater agency-driven moves and an ethical risk-taking behavior. Gaining understanding of the social organization of student agency and risk-taking for problem posing has design and practical implications for socio-mathematical norm setting in the classrooms. It will allow researchers and teachers to pay attention to the pedagogical conditions and classroom social norms to nurture students' collective agency as an ongoing process of collaborative mathematics learning.

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