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Framing agency as a lens into constructionist learning

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Abstract

Problem Statement. Because of prior experiences in instructionist settings, students may struggle to direct their own work in constructionist learning environments that require them to frame problems.

Aim. We introduce the construct *framing agency*, defined as opportunities to make decisions that are consequential to framing problems and learning. Specifically, we sought to ground this construct in constructionist learning experiences across a range of instructional settings.

Research questions. What does student discourse reveal about framing agency? How might framing agency shed light on the ways student engage with constructionist learning experiences?

Methodology. We selected data from previously collected cases and reanalyzed them for this discussion. In the current study, we focus on cases drawn from two sites: (1) student teams in an industry-sponsored, capstone, two-semester biomedical engineering design course at a large research university in the American West; and (2) undergraduate and graduate students from diverse backgrounds in an interdisciplinary research lab at a Hispanic-serving university in the American Southwest. All data were originally collected through Svihla's extended (nine months or longer) participant observation that included audio and video records and field notes of students' classroom interactions. We analyzed multiple cases from each site using sociolinguistic analysis to characterize framing agency. We compare and contrast these cases to illuminate some nuances of framing agency.

Key findings. We identified three key markers of agency in students' talk: hedging, sharing agency, and using verbs that express potential control. In contrast, use of verbs—even minimal use—showing no control over the problem characterized a lack of framing agency. When facing the ambiguity of framing problems, some knew to use their agency to dwell with the problem, and others situated tasks as out of their control and scope of work, even in settings in which it was clearly in scope.

Contribution. Framing agency provides a lens into how prior experiences—dominated by solving archetypical well-structured problems with predetermined solutions—can covertly structure students' engagement with constructionist learning experiences.

Keywords (style: Keywords)

Design learning, Problem framing, Agency, Discourse analysis, Teams

Statement of the problem

Instructors aiming to create constructionist learning experiences are sometimes thwarted by students' expectations about teaching and learning. Students' prior instructionist experiences in school settings, which typically focus on well-structured problems—problems that have a single correct solution and a most efficient solution pathway (Jonassen, 2000)—can lead them to expect more of the same. As a result of such experiences, students may not understand that they need to *frame* the problems they encounter in constructionist learning settings (Crismond & Adams, 2012); instead, they may treat such problems as always having a single right answer (Christiaans & Dorst, 1992; Rowland, 1992). Additionally, instructors must negotiate tensions between overly scaffolding progress, such that students have too few opportunities to make consequential decisions, and providing too little direction, such that students flounder unproductively.

Compared to problem solving and relevant psychological constructs, research has paid much less attention to effectively supporting students in their problem framing process. This is in part because of the nature of this framing, which involves interacting with diverse activities and approaches (Murray, Studer, Daly, McKilligan, & Seifert, 2019; Resnick & Ocko, 1990). Here, we argue that improved understanding of what problem framing looks like and ways to differentiate efforts to frame problems from efforts to maintain a well-structured problem space is needed. To this end, we introduce the construct *framing agency*, defined as making decisions that are consequential to framing design problems and learning through this process. We characterize framing agency by considering discursive exchanges among students working to frame problems in constructionist learning settings.

Theoretical Framework

Constructionist learning settings involve learners in participatory roles, situating them as designers (Resnick & Ocko, 1990). We argue that this aspect makes agency particularly salient for constructionist settings. To theorize framing agency, we build on research on design problem framing and agency, pulling broadly from extant literature on learning, social sciences, and beyond.

Why must design problems be framed and how do designers accomplish framing?

Design problems—compared to well-structured problems that have a single correct answer and canonical solution path—have multiple solutions and solution paths (Jonassen, 2000). As a result, designers must structure the problems they aim to solve (Restrepo & Christiaans, 2004; Schön, 1983). While a design brief may describe client needs, desires and context, the problem still requires framing (Coyne, 2005). As such, framing design problems involves understanding needs, context and requirements, setting boundaries, and exploring tentative solutions (Atman et al., 2008; Morozov, Kilgore, & Atman, 2007). Designers gather information deliberately to clarify ambiguity and rule out untenable solution paths (Basadur, Graen, & Green, 1982), seeking divergent stakeholder perspectives (Daly, McKilligan, Murphy, & Ostrowski, 2017), understanding research shortcomings of existing solutions, and identifying resources available to them (Dominick, 2001). In defining the bounds of the problem (Atman et al., 2008), designers also identify constraints and criteria for success and question the information given to them (Atman, Chimka, Bursic, & Nachtmann, 1999; Dominick, 2001). Even gathering information is itself a contextual and contingent process, as designers seek to address gaps in their own understanding (Tracy, 2005) in relation to tentative solution paths (Rittel & Webber, 1973). Designers therefore make many consequential decisions, both about the problem frame and about how to proceed in framing processes (Dorst & Cross, 2001; Schön, 1983). Problem framing is an agentive process (Hanauer, Frederick, Fotinakes, & Strobel, 2012) that builds a sense of ownership over the problem (Newell & Simon, 1972; Restrepo & Christiaans, 2004; Schön, 1987).

How is agency related to designing and learning?

In social science research, agency is typically defined as making decisions (Alsop, Bertelsen, & Holland, 2006). Agency depends on opportunity structures (Narayan & Petesch, 2007)—that is, whether there are opportunities to make decisions, whether students actually make decisions, and whether they are satisfied with the outcomes of their decisions (Alsop et al., 2006). In instructionist settings, students have limited agency. Even in student-centered classrooms, they typically only make choices about format (poster or presentation) or ‘menu’ options (e.g., choose an animal, holiday, explorer, to research and report on). Students seldom have choices about what to learn, or how to proceed in their problem framing and solving process in instructionist settings (Resnick & Ocko, 1990). As a result, students may flounder when they have opportunities to make such decisions in constructionist settings. Engeström and Sannino (2010) argued that an outcome of learning should be increased agency, meaning students need opportunities to practice using their agency. The coercive effects of past instructionist experiences can shape the kinds of decisions students make, suggesting the need to consider not just whether students have agency, but also what kinds of agency they have.

Why contextualize agency?

Many have argued that learning and performance are situative (Greeno, 1998; Lave & Wenger, 1991), necessitating contextualized views of constructs. For instance, self-efficacy is typically considered in relation to specific situations—few would claim that if someone had high science self-efficacy, they would also necessarily have high self-efficacy in all subjects. We argue that agency is likewise situated.

Others have proposed different *forms* of agency. For instance, Engeström and Virkkunen (2007) proposed that *transformative agency* involves making deliberate changes in one’s work by resisting, considering new possibilities, committing to making changes, making consequential changes (Engeström, 2011), criticizing (Haapasaari, Engeström, & Kerosuo, 2016), and critiquing one’s own agency (Heikkilä & Seppänen, 2014). In this approach, different forms direct us to consider what constitutes agentive activities and their role in bringing about change.

Scholars who study agency have noted that it may be shared with others, and in design processes, it may also be shared with materials (Knappett & Malafouris, 2008) and envisioned stakeholders. In longer term collaborative work, members’ accounts of their decisions as collective (e.g., “We decided to...”) can reinforce their sense of shared agency (Tollefsen & Gallagher, 2017). Scholars have debated how simple alignment between two individual’s choices becomes collectively shared (e.g., Bratman, 2013; Gilbert, 2009) and have investigated the individuals’ capacity to engage in shared tasks. For instance, (Edwards, 2007) proposed *relational agency*—the ability to offer and seek support from individuals in different positions from one’s own. Similarly, Kafai and colleagues proposed *collaborative agency*—“the ability to choose collaborators, organize work, and design together in an unstructured context where roles, tasks, and people are not specified” (Kafai, Fields, Roque, Burke, & Monroy-Hernandez, 2012, p. 65). While many have studied similar issues from the lens of self- and co-regulated learning (Law, Ge, & Eseryel, 2016), we appreciate the lens that agency brings, as it focuses on the choices individuals and groups must make, rather than on the actions conjectured to be important (e.g., asking for clarification). We argue this view of agency opens a space to empirically re-evaluate both the ways participants make decisions and the kinds of decisions they make, and both are potentially productive in problem framing. For instance, analysis of collaborative agency highlighted that students made *different* decisions about how to organize their collaborative work as the nature of the work changed across a design project and emphasized that “it is youth themselves who need to make choices about who to work with, how to contribute to work” (Kafai et al., 2012, p. 80).

Other contextualizations of agency have been proposed related to media production: critical agency relates to “learning how to critically engage with digital content and practices” and cultural agency relates to “learning how to navigate cultural identity with digital media production” (Kafai, Fields, & Searle, 2019, p. 2). Such contextualizations highlight that the kinds of decisions and information needed to make those decisions are contingent and situated.

We conjecture that framing agency—making decisions that are consequential to framing problems and learning as a result of those decisions—helps differentiate between learners' engagement in activities as instructionist or constructionist. This is important knowledge for instructors and learners as they negotiate instructional goals and shape praxis knowingly and unknowingly through discourse.

Methodology

Using a qualitative case study lens (Creswell, 2013; Ragin & Becker, 1992), we analyzed discursive exchanges among some collaborating students that Svihla documented through participant observation (Atkinson & Hammersley, 1994; DeWalt & DeWalt, 2010). We aimed to clarify framing agency as a construct and to analyze what the students' discourse revealed about the process of making decisions consequential to framing and learning in a collaborative setting. The following questions guided our analysis:

- What does student discourse reveal about the process of making decisions that are consequential to students' framing and learning?
- What kinds of discourse patterns differentiate between framing agency and other kinds of agency (e.g., deciding to disengage, making decisions that situate learning as instructionist)?
- How might framing agency shed light on student engagement with learning experiences that are intended to be constructionist in nature?

Data Collection, Prior Analysis & Case Selection

Data were gathered from two sites. First, we selected cases from a canonical design field—engineering—in a setting intentionally created to help students learn to design. While not identified as constructionist by the faculty, the course displayed many hallmarks of constructionism. Student teams ranked their choices of industry client and were generally matched to their first or second choice. The teams sought to meet a client need, detailed in a design brief, and they presented their final solutions to their clients at the end of the two-semester sequence. Yet, largely due to their experiences with prior coursework, which emphasized accuracy, some teams treated the process as finding “the right answer.” Prior analysis highlighted differences in the teams' navigations of impasses in designing (Svihla, 2010; Svihla, Petrosino, & Diller, 2012). Experts' assessments of the quality and creativity of their early and final work provided an outcome variable, highlighting differences in the paths of each team over the course of many months that led to more and less creative and quality outcomes. We selected cases based in this prior study for this current analysis, focusing on two cases with different paths and outcomes—Tom's team and Steve's team.

Tom's team, mentored by teaching assistant (TA) Shanti, included Cynthia, Addai, and Greg. Their client was a physical therapist from a local hospital, who wanted a means to objectively measure spasticity in patients' limbs. The team planned to design a glove with a pressure sensor and accelerometer. However, Tom, who was adept at thinking in vector space, realized an accelerometer could be moved in ways that would register no movement. Consequently, the team worked to frame and reframe the problem. We argue they maintained an opportunity structure for members to have agency over framing the design problem.

Steve's team, mentored by TA Michelle, included Daniela, Dillon, and Bob. Their client, the director of a local biomedical technology company, wanted a way to measure specific biochemical processes in the body as an early warning system for sepsis following surgery. Steve's team struggled to define this as a design problem and resisted reframing the problem. Instead, they treated the problem as well-structured and their task as finding the right answer.

Second, we selected a case outside the canonical design fields, but in which problem framing was particularly salient: an interdisciplinary research lab focused on the roles of bacteria in caves. Due to the exploratory nature of their research, this team's work had a designerly quality as they found

they needed to design new methods of data collection and analysis, make numerous decisions about representations of their results, and craft explanations for these, a practice they labeled as “finding the story in the data.” Prior analysis highlighted the diversity of the lab and ways the principal investigator encouraged student participation, even from new undergraduate members.

Denise’s lab included undergraduate and graduate students from diverse backgrounds (n=16 across four years, with approximately seven students participating at any one time): two Native American students, six Latinx students, one African American student and a majority of students who were first generation college attendees; the gender balance was generally close to even. Students majored in fields like chemistry, biochemistry, biology and geology. Denise explained that she recruited students who were “in the middle academically,” and who might be in “danger of leaving or not considering science careers.”

Data Analysis

We re-transcribed data to allow for a more fine-grained analysis that focused on the discursive exchanges within and across the teams. We first adapted the agency toolkit, an approach to linguistic analysis that directs attention to autonomy (Konopasky & Sheridan, 2016) (Figure 1). Konopasky and Sheridan (2016) developed the agency toolkit based on their analysis of interviews with adults about their decisions to drop out of school as youth and later enter a GED program; their focus included intentional causation and degree of autonomy.

To characterize *intentional causation* in discourse, the researchers considered whether the speaker framed themselves as an agent or as someone acted upon by focusing on the use of “I” or “we” as opposed to placing oneself as the object (e.g., “It was assigned to me”) and using verbs that involve an action that affects someone else (“I showed him how to solder” versus “I soldered the LEDs”). While Konopasky and Sheridan (2016) argued that “I” and “we” could be treated interchangeably, we posited that in team design settings, it is important to differentiate between these. Likewise, our past work on design teams has made clear that materials are salient actors in design process (2018), as designers have reflective conversations with the materials (Schön, 1992).

Konopasky and Sheridan (2016) characterized the *degree of autonomy* using hedging and mitigation, such as evidenced by using the generic “you” in which the speaker places themselves amongst many, reducing their agency or using a clause that offloads agency onto another or the environment (“I used a pipe cleaner because it was all I had”). We sought to differentiate between those cases and situations in which designers justified their decisions (“I used a pipe cleaner because it is conductive and unexpected”). In addition, because designers aim to remain tentative in early problem framing, we posit that hedge words might reveal this stance as team members negotiated design ideas.

We more carefully focused on situations in which students exhibit a *lack of control* and *potential control*. We characterized this through verb and pronoun use (Figure 1), anticipating that this approach, paired with review of the targets of their comments, would provide clearer differentiation between displays of agency and their connections to framing and non-framing actions.

Shared agency marker. First person plural pronoun (we, we're, we've, we'll)

Tentative agency marker. Speaker modifies statement with diminishing hedge terms (like, actually, perhaps, maybe, kind of, possibly, might, apparently, just, sometimes, etc.)

Tentative agency marker. Verbs that show potential control (could, might, should, can, going to, would, want to, etc.)

Low agency marker. Verbs that indicate a lack of control (told to, have to, need to, must, required, supposed to, etc.)

Figure 1. Markers of agency used to differentiate framing agency from other forms

Reliability & trustworthiness

We used common strategies to ensure trustworthiness in data collection and analysis (Maxwell, 2012): (1) *Purposive sampling*. For the first site, the original team selection emphasized heterogeneity, with input from faculty, teaching assistants, and access to students' course grades and internship participation. For the current analysis, we likewise emphasized heterogeneity in participation and outcomes, allowing us to compare and contrast. For the second site, we reviewed all data previously coded as involving problem framing, as our goal here was to contrast a non-canonical design site with a canonical design site. (2) *Intensive involvement*. In the original data gathering, Svihla spent approximately 100 hours with each team over the course of one academic year from the first site, and approximately 150 hours with the second site. She developed rapport with the participants; and in both sites, members sought her advice on various aspects of their work. Her sustained presence and observations helped reduce the potential for spurious inferences. (3) *Individual coding & debriefing*. For this current work, in effort to reduce bias, we individually (re)analyzed the transcripts, first making our own inferences about them, and then meeting several times to discuss our understandings. (4) *Triangulation*. Given the large data corpus, we also reduced bias by triangulating the findings over time, across individual participants and teams, and across data sources. For discourse data, this involved reviewing their speaking style (e.g., how commonly they used hedge words) across multiple interactions with different individuals. (5) *Member checking*. The original analysis was subject to formative and final member checking by participants. However, due to the timing of the analysis reported here, additional member checking was not feasible. This limitation should be addressed by additional studies.

Results

In the next sections, we present our analyses of the following vignettes to illustrate differences in students' talk as they both enacted and shied away from framing agency.

Tom's team: Tentative, shared problem framing

After receiving the accelerometer, Tom realized that if one were to move in a direction opposite to the direction of gravity at the same velocity as gravity, no motion would be recorded. Later (in mid-February), he spent an hour carefully presenting this anticipated problem to his team. The team members initially seemed concerned there was no way forward. Addai put forward a tentative solution, displaying relatively low agency (Figure 2).

Addai minimized risk associated with introducing his idea by calling it a "first draft." His hedge words and use of the generic "you" mitigated his agency. Tom reacted positively, widening the opportunity for Addai to pursue this line of thinking, which scaffolded Addai to continue reframing the problem. In response, Addai's discourse was less tentative; he shared agency with his team ("we").

Vignette 1: Feb 11

Addai: Instead of taking measurements in three dimensions, this is this is like maybe a first draft. //
Tom: //hm!//
Addai: //You throw away the position information.
Tom: Right.
Addai: And we roll the XYZ coordinates into just one combined vector and that way we've always accounted for your full gravitational contribution.
Shanti: That's a good idea!
Cynthia: Yeah.
Shanti: Like a magnitude (.) of all three of them like a//
Addai: //Exactly. Exactly. So if you roll them all together you can still figure out

Vignette 2: 5 min. later

Addai: Like I said I'm still not sold on it, but. I'm not sold on it, but I like the way it looks.
Tom: mmhmm [positive]
Shanti: Yeah anyway try it out it might work I don't know.
Addai: [quietly] You do lose, uh I think you do lose your position because you rolled all of your axes.
[louder] But it would be a much easier way also to keep track of your overall change

Figure 2. Vignettes from Tom's team, color-coded as defined in Figure 1

In vignette 2, although Addai presented his idea as one he was not yet “sold on,” Shanti encouraged the group to “try it out” because “it might work.” By doing so, Shanti scaffolded Addai's thinking and advanced the team's framing process, without taking an authoritative role, although this is the role afforded her as a TA. Addai acknowledged the team's concerns, but exhibited a firm belief in his idea by increasing the volume of his talk.

Across these and other interactions, Tom and Shanti—both occupying positions of power—maintained opportunities for other members to reframe the problem. They scaffolded Addai to move from throwing forward the earliest draft of an idea to ultimately displaying shared ownership of a solution that eventually came from his reframing of the problem.

Steve's team: Shutting down framing

Steve's team generally displayed agency to solve the problem as given to them (Figure 3). Concerned they were not *designing* anything, TA Michelle encouraged them to “try to have some kind of engineering analysis” and pressed them to explain why their project was “so great.” Her concern reflected the instructor's comment, “What can you really uniquely contribute as an engineer?” as she pressed, “Why is there a need for it?” The students explained the potential for saving lives by having a way to detect symptoms of shock, yet they generally sought *right answers*, for instance, investigating whether a sensor performed according to specs in an experiment.

At the beginning of vignette 3, Daniela's interactions showed framing agency as she brought up her concern about the plan, but Steve and Dillon rejected her idea as out of scope. This pattern was common: Steve displayed high agency and Dillon repeated Steve's words as if to amplify them. Steve made decisions, but they were not consequential to the *framing* of a design problem. In this, he and Dillon shut down Daniela's attempts to frame the problem, limiting the impact of her ideas on the discussion. During this exchange, TA Michelle offered no scaffolding, and the problem failed to become a design problem. Daniela expressed frustration multiple times (“something bothers me”).

Vignette 3: Feb 4

Daniela: I just thought that something bothers me the fact that (.) yeah we're gonna put the sensor on the stomach (.) right? During surgery? (.) But then (.) we're gonna, the surgery only lasts like one::: to two hours and we're gonna take it off and the patient is gonna be, (.) um well the surgery is gonna be over and there's not gonna be any monitoring afterwards, and I'm thinking (.) Well there's higher chance of sepsis or shock appearing after surgery. So::: should we think about leaving the sensor? or::: (.) 'cause I don't really think it's//

Dillon: //Seriously, that could be like, the next step.

Steve: Yeah.

Dillon: Right.

Steve: I think that—are you talking about like for like in real life? like

Daniela: Yeah. Like what what's the use of it if // you're just gonna

Steve: //I think

Bob: //I thought I thought the problem—the project was to do an internal sensor that it could be left there.

Vignette 4: 2 min later

Steve: I would think that would be something left up to a surgeon or something to be honest I mean likelikelielik our project. I think it's kinda outside the scope of our project our project is//

Bob: //If we left it up to the surgeon and whoever actually designs the sensor.

Steve: Yeah whoever is really doing this.

Bob: 'cause we're not supposed to be designing anything.

Figure 3. Vignettes from Steve's team, color coded as defined in Figure 1

Research lab: Tentative, less shared

In Denise's lab, members commonly contributed to framing, while generally leaving ownership of the problem with the eventual author (Figure 4). Lab members explicitly engaged the interdisciplinary nature of their work, as when Tania talked about getting a new idea by attending a talk outside her field (Vignette 5). Tania's introduction of how she got her new idea showed that she knew outsider points of view were valued within the lab, and she presented this with little tentative talk. But as she began to explain the connection she saw between the “mass of the star” and her bacteria, she became hesitant, using more tentative language as she made her idea clearer, training off with “I don't know.” Denise, however, seemed intrigued, evidenced by her first “hmm!” and encouraged Tania to go on; she did, though with a little uncertainty in her voice. Denise affirmed that while she did not have the expertise to evaluate the idea, she recognized the approach as potentially useful. This exchange showcases both Tania's comfort in bringing a new idea forward and Denise's work to make space for new ideas; each individual demonstrated value for other points of view.

In vignette 6, as they began to frame this problem, Nora and Denise negotiated what might be “interesting” to attend to. Denise's idea that the contrast between the acidic surface and basic cave environment could “actually be important” presented the problem as tentative and the possible variables as likewise tentative. This invited Nora, an undergraduate student, to contribute to the team's work using her knowledge from chemistry coursework. Denise showed that she valued this contribution as she built on Nora's explanation that the rate “changes for every temperature.” This exchange illustrates how Denise welcomed new ideas and relied on students to contribute substantially during lab meetings.

Vignette 5: Stars talk

Tania So I had this idea. I went to this stars and constellation talk. Totally different. Not my field. But someone, or one of the speakers spoke about how they look at the color of light that is being emitted that would help tell the mass of the star.

Denise: Okay.

Tania: And I am wondering if there is something similar where//

Denise: //hmm!//

Tania: //bacteria, if they are emitting a light or a (.) compound that maybe you could. I don't know.

Denise: There may be something along—

Tania: Maybe something out there that could at least tell us what it looks like?

Denise: That's interesting. This may be some of the techniques, I just don't know, but it would be worth—One of the ways to make progress on something like this is to look at what other fields do.

Vignette 6: Dichotomies

Denise Here's a question. Caves tend to not—What happens if there's a dichotomy? It's very acidic because of pine trees, but the cave is basic. If there's a dichotomy like that, what happens? That could be a question.

Nora: It is—pH and temperature is really important.

Denise: There are wildly different temperature regimes between surface and subsurface.

Nora: Inside the cave is interesting//

Denise: //But that change from surface to cave. (.) Could be really important. At least at [the particular cave location] it is high elevation, juniper, pinion, high enough at that boundary. That may actually be important. Really good stuff.

Nora: pH, temperature will effect it too. Remember in chemistry? The rate limiting step? The slope changes for every temperature.

Denise: It's cold in caves.

Nora: That could slow the process.

Figure 4. Vignettes from Denise's lab, color coded as defined in Figure 1

Discussion

By analyzing design talk, we identified discourse patterns connected to agency in problem framing. Across both cases from canonical design settings, we saw the team leader work within an initial problem frame and another member tentatively put forward an idea. In Tom's team, this idea eventually became part of the final solution, which yielded a reframed problem. Essentially, Tom and Shanti opened spaces for Addai to reframe the problem.

In contrast, when Daniela suggested leaving the sensor in, Steve and Dillon rejected her idea as out of scope. Steve's displays of confidence prevented negotiation of the problem space. While Bob opened a space to reconsider Daniela's reframing, his effort was fleeting. This pattern was consistent when new ideas were put forth, as if the team did not see its role as shaping the problem. We do not know if Daniela's experiences drove her to find design encounters elsewhere, but we see this as a missed opportunity to learn to frame problems and her peers did not get to learn from her through this process.

Our analysis of Denise's lab highlighted similar patterns reflected in Tom's team, with Denise scaffolding students' tentatively proposed ideas, opening space for students to frame without hesitation. In contrast to the design teams, in Denise's lab, much of the framing work was situated individually rather than shared collectively. Yet, even situated as such, we see evidence for distributed constructionism (Resnick, 1996) in members' efforts to contribute to another's problem frame.

While these data and our analysis of them are limited in time and scope, we argue the contrast between Tom's and Steve's teams provides insight about the kinds of experiences that can help

learners develop increased capacity for framing agency. Tentative talk—commonly noted as suggesting low agency (Konopasky & Sheridan, 2016)—rather than being a barrier, was actually a resource for Addai to develop his idea because his collaborators nurtured his participation. This aligns with past work showing that responsiveness/politeness helps groups successfully solve well-structured but complex problems (Barron, 2003; Chiu, 2008) when they have authority to work on problems (Brown & Campione, 1998) and act on this authority. By seeking to conceptualize framing agency as a specific skill set within interactional contexts, we bring renewed focus and clarity to the kinds of framing moves that learners might make, and the ways their peers and instructors can support them to develop tentative ideas into solutions over which they feel a sense of ownership. For students to develop capacity to frame problems, they need constructionist experiences and supports that help them move beyond the instructionist settings to which they have become accustomed.

Our future work investigates how this discourse analysis approach may be used to inform interventions that could support the development of framing agency in varied learning settings. Specifically, we wonder about ways to help students recognize the need to frame the problem, and if attending to their talk will help them track their reactions to the ambiguity that problem framing presents.

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