

“I’m Going to Feel Like a Failure”— How Group Dynamics Influence One Black Girl’s Agency

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Abstract

Science learning is thought to be best supported when students are positioned as epistemic agents. Using a case study approach, we explore the experiences of one Black middle school girl, Jessie’s, epistemic efforts and the ways in which her group members’ responses to her efforts either supported or constrained her epistemic agency during small group work in two argumentation lessons. Our findings show that Jessie’s epistemic efforts were not often taken up by her peers in ways that support her epistemic agency, findings that have implications for student learning and engagement in terms of the epistemic work we ask students to engage in, and the instructional strategies that support this work.

Purpose and Perspectives

Educational reforms have positioned the development of science proficiency as the end goal of science instruction—that is, students should be able to use the tools of science to construct scientific explanations (NGSS Lead States, 2013). This work requires that students are positioned as epistemic agents (Miller et al., 2018; Stroupe, 2014) who share, discuss, and refine their thinking (Berland & Reiser, 2009; McNeill, 2011).

To support students to be epistemic agents, classrooms need to be structured as equitable spaces where students feel their ideas are valued by themselves, their peers, and their teachers--that is they must be viewed by others and themselves as entitled, expected, and worthy of contributing to the [classroom] community's advancement of scientific knowledge (González-Howard & McNeill, 2020). Equity, however, is often framed around ideas of access and inclusion for *all* (Martin, 2019). This framing does not always acknowledge that classroom spaces are embedded in cultural systems of knowledge and practice grounded in whiteness and heteropatriarchy (Calabrese-Barton et al., 2022; Ladson-Billings, 2006) that position historically marginalized students as outsiders with minimal power and authority (Nasir & Vakil, 2017). Inviting students into these spaces and expecting them to participate in existing ways of doing manifested in systems of privilege and oppression (Milner, 2015) not only limits their agency but may also impact the value they place in engaging in similar future endeavors given the required effort and associated costs (e.g., emotional, epistemic) this engagement requires (Eccles et al., 1983; Wigfield & Cambria, 2010).

If we are to support students to become epistemic agents in the equitable ways envisioned in reforms and discussed among the science education community, we must acknowledge that classrooms are spaces of injustice where a singular approach does not work. We must understand how instructional reform efforts support students’ agency work (or do not) for all students. As Calabrese-Barton and colleagues (2022) point out, we must renegotiate “what the rights to being and learning in science are or could be” (p. 54), especially for historically marginalized students. To engage in this renegotiation, we must attend to who has the rights to participate and to understand the struggles to belong in science that arise in science learning.

Accordingly, this research aims to understand rights and privileges viewed through the experience of one Black middle school girl, Jessie, and her efforts to participate in sensemaking in a science classroom. We build from the work of González-Howard and McNeill (2020) that points to the importance of positioning students as capable of participating in knowledge critique and refinement, processes that are consequential for learners' sense of agency and value within a learning community (Calabrese-Barton & Tan, 2020). We examine Jessie's epistemic agency across two argumentation lessons as she and her group members worked to construct claims based on evidence. In particular, we examine Jessie's epistemic efforts and the ways in which her group members' responses to her efforts either invited or constrained her epistemic agency.

We ask the following research questions:

1. What epistemic aspects of scientific argumentation does Jessie engage in during small group argumentation activities?
2. What epistemic aspects do Jessie's group members engage in?
3. How do these ways of argumentation invite or discourage Jessie's epistemic agency?

Methods

This case study— an approach that allows for an in-depth examination of complex issues bounded by context (Creswell, 2007; Miles et al., 2014)—was situated in a middle-school biology classroom. We examined Jessie's epistemic agency across small group argumentation episodes bounded by two lessons (Table 1). Here we focus on Jessie (all names are pseudonyms) and her group members who differed across the two lessons (Table 2).

Data Sources and Analysis

Data sources included videos of small group interactions, which were transcribed, and student work products. Small group interactions were the main sources of data and were analyzed to identify moments when **Jessie and her group engaged in aspects of scientific argumentation** (See Table 3 for the codebook). We examined these interactions **to determine how Jessie's group member's ways of argumentation invited or discouraged her epistemic agency**. In this analysis, we attended to discourse and multimodal affective markers to understand how her peers' responses and interactions invited or discouraged Jessie's epistemic agency.

Results

Examination of the lessons yielded different ways of argumentation that Jessie engaged in as she worked to have her ideas heard and taken up by her peers. In both lessons, her group members engaged in different ways of argumentation that invited or discouraged her epistemic agency.

Cell Structure - Misalignments: Epistemic, Rhetorical, and Pseudo-argumentation

During the *Cell Structure* activity, the main interactions occurred between Jessie and Lee who held competing claims. Jessie engaged in the epistemic aspects of *using evidence and reasoning to support her claim* (“the evidence is that there is no cell wall, the cell doesn't have a defined shape.”), *challenging the evidence and reasoning of others* (“So the only evidence to saying that this is an animal cell is it doesn't have the cell wall?”), and *examining evidence and reasoning against existing theories* (e.g., Pointing to the characteristics of a plant cell in her lab notebook.). Lee responded to Jessie's efforts by employing *rhetorical ways of argumentation*, emphasizing his claim without providing evidence, instead, challenging Jessie to convince him of her claim

("Then give me, then give us evidence, support the evidence, support your claim."). Further, he took a competitive stance, boasting that "I'm the only one that says animal..." Jessie and Lee were animated in their interactions, with both students having increased intonation in their voices and using body gestures. While both Jessie and Lee exhibited increased intonation, Jessie's intonation and gestures took on characteristics of exasperation and frustration ("If I'm wrong, I'm going to feel like a failure." and "You guys are not listening to me!"), while also making gestures (e.g., placing her hands on her head, rolling her eyes). Lee took on characteristics of mocking and aggression.

While Jessie's *epistemic* and Lee's *rhetorical ways of argumentation* dominated, Chad engaged in another type of argumentation. As the scribe, Chad wrote down Lee's claim, a choice that he acknowledged was at odds with his ("*We all think it is a plant and Lee is the only one who thinks it's an animal.*"), Kendall's ("*We don't have a lot of evidence for it being an animal.*"), and Jessie's claim. Chad asked Jerry what he should do with these competing ideas, a question that Jerry responded to by emphasizing that the group just needed to have a claim ("*Well, you wrote animal so just roll with that, you can just give your side of the story [when presenting].*"), even if they did not all agree. This was taken up by Chad and Kendall in the ways of *pseudo-argumentation*, in that they continued with Lee's claim with no further attempts for negotiation.

Examination of Jessie's epistemic efforts and her peers' actions suggest that the ways in which her peers were failing to take up her efforts served to discourage her epistemic agency. As an example, Lee's *rhetorical ways of argumentation* in which 1) he pressured Jessie to convince him he was wrong and 2) he engaged in argumentation as a competition to win, were at odds with Jessie's reliance on the scientific norms of argumentation. We see a manifestation of this discouragement as Jessie becomes increasingly more exasperated and frustrated by Lee's competitive stance. Indeed, we hear Jessie say on multiple occasions, "Show me your evidence." Second, Chad's ways of *pseudo-argumentation* in which he followed the directions of the teacher to produce an argument. Chad's stance, while initially supporting Jessie's claim, eventually served to discourage her epistemic agency. The group failed to take up her bid to revise their argument, even when she shared evidence and could reason why that evidence supported her claim.

Mechanisms of Evolution - Misalignments: Rhetorical and Pseudo-argumentation

During this activity, Sandi and Russell engaged in *epistemic aspects of argumentation*, including using evidence to support their claims, challenging each others' ideas, and working to negotiate a consensus claim. Desmond engaged in *rhetorical* ways of argumentation, emphasizing the correctness of his claim. Many of the interactions during this work occurred between Sandi, who took a leadership role in the group, Russel, and Desmond. Jessie made multiple bids to have her ideas heard during these interactions, bids that were largely not taken up by her peers, acting to discourage Jessie's epistemic agency rather than invite it.

In these interactions, the group's eye gaze and body directionality were largely oriented toward Sandi, the group member that continually challenged Marshal and Desmond's arguments, pressing them to develop a consensus explanation. However, unlike Marshal and Desmond, Jessie's bids to interject her ideas into the conversation were not taken up by Sandi or the other group members. For instance, after multiple attempts to have her ideas heard by the group, interjecting comments that reflected using evidence to support her reasoning, Jessie wrote her ideas on a piece of paper and passed it to Sandi. Sandi was observed glancing at the paper, examining its content, and putting it down before turning back to Marshal and Desmond to

continue their discussion. After some time passed, Jessie slid the paper back across the table and then placed her elbows on the table, leaning over, and looking down and away from the group. Jessie made multiple attempts to similarly have her ideas taken up by the group, showing signs of exasperation such as putting her hands on her head, looking away, or seeking out Jerry to share her ideas when they were not acknowledged by the group. Indeed, it was not until Jessie became the scribe, recording the group’s argument, that her ideas were acknowledged by the group, inviting her epistemic agency. For instance, when Jessie, with a marker in hand, acknowledged that she did not agree with the group’s claim, Sandi exhibited concern that her ideas were not being heard. These efforts, however, were cut short when the group made a move to “get something down” on the poster to complete the task (i.e., *pseudo-argumentation*).

Scholarly Significance

The case study presented here points to the dynamic and contextual nature of epistemic agency for students, in this case, a young woman of color. Jessie’s actions across these two lessons allow us to understand how individual efforts are essential for epistemic agency, but these efforts must be taken up by the larger community. In many ways, Jessie’s continued efforts to be seen as an active contributor to the knowledge construction and critique that she understood to be the goal is to be celebrated. She was persistent in her efforts for her ideas to be considered by her peers. That persistence is remarkable given the ways in which her peers worked (either actively or by omission) to push her efforts toward the periphery. These efforts can be seen as microaggressions that can too easily find a home in argumentation or *pseudo-argumentation* in classrooms. Microaggressions are “everyday derogations, slights, and invalidations that are often delivered to people of minority or marginalized backgrounds” (Lui & Quezada, 2019, p. 45). We recognize that Jessie’s status as a woman of color played a role in shaping how her efforts to exert her epistemic agency were taken up by or rejected by her peers. This analysis illustrates the interplay of the personal and community in the performance of students’ epistemic agency. Recognition of this interplay is essential for researchers to understand so that tools and scaffolds can be created to assist teachers in establishing norms to ensure that all students’ epistemic efforts are considered in more robust and responsible manners--knowledge that is essential if the epistemic work we ask students to engage in can become more effective and just.

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Table 1. Lesson Descriptions

Lesson 1 (Four days) - <i>Cell Structure</i> (Sampson et al., 2014)
The lesson positions students to apply their understanding of cells to develop an evidence-based claim in response to the guiding questions: How should the unknown microscopic organism be classified?. In this activity, groups examined an unknown organism under a microscope, they discussed whether they thought it represented a plant or animal, and they developed an argument based on evidence to support their claim, which they shared on a group poster.
Lesson 2 (Three days) - <i>Mechanisms of Evolution in Venezuelan Guppies</i> (Sampson & Schleigh, 2013)

The lesson positions students to explore an existing data set and to develop an evidence-based claim from those data in response to the guiding question: What causes color variations in Venezuelan Guppies?. In this activity, groups examined a data set representing different types of predatory fish, different colors of guppies, and different abiotic characteristics occurring in the stream environment where the guppies live.

Table 2. Student Demographics

Group 1 (Lesson 1)
two boys, one white and one Asian, named Chad and Lee, respectively, and one Black girl named Kendall
Group 2 (Lesson 2)
two boys, one white and one Asian, named Desmond and Tan, respectively, and one white girl named Sandi

Table 3. Ways of Argumentation Codebook

Ways of Argumentation	Description
<i>Epistemic</i>	when student(s) aligned with the epistemic aspects of scientific argumentation, such as using evidence and reasoning to support a claim, challenging the evidence and reasoning of others with competing claims, or examining evidence and reasoning against existing theories (Berland & Reiser, 2009; Duschl, 2007, 2008; Sampson & Clark, 2008)
<i>Rhetorical</i>	when student(s) aligned with persuasive aspects of argumentation in which students took a competitive stance stressing differences of opinions rather than working to understand those differences, or emphasizing the correctness of their claim with minimal regard for evidence, reasoning, or competing claims presented by others (Mercer, 2000; van Eemeren et al., 1996; Walton, 1998)
<i>Pseudo-argumentation</i>	when student(s) engaged in the ways of doing school, that is when they worked to satisfy the teacher or focused on completing the task without attention to sensemaking or to coming to a consensus understanding (Berland & Hammer, 2012)

References Cited

- Berland, L. K., & Hammer, D. (2012). Framing for scientific argumentation. *Journal of Research in Science Teaching*, 49(1), 68 – 94.
- Berland, L. K., & Reiser, B. J. (2009). Making sense of argumentation and explanation. *Science Education*, 93(1), 26-55.
- Calabrese Barton, A., & Tan, E. (2020). Beyond equity as inclusion: A framework of “rightful presence” for guiding justice-oriented studies in teaching and learning. *Educational Researcher*, 49(6), 433-440.

- Calabrese-Barton, A., Tan, E., Schenkel, K., & Benavides, A. W. (2022). Towards Justice: Designing for a Rightful Presence as a Lens for Science Teacher Education Research. In *Handbook of Research on Science Teacher Education* (pp. 52-63). Routledge.
- Creswell John, W. (2007). *Qualitative inquiry and research design: Choosing among five approaches*. Thousand Oaks, CA: Sage Publications, Inc.
- Duschl, R. (2008). Science education in three-part harmony: Balancing conceptual, epistemic, and social learning goals. *Review of Research in Education*, 32(1), 268-291.
- Eccles, J., Wigfield, A., Harold, R., & Blumenfeld, P. (1993). Age and gender differences in children's self- and task perceptions during elementary school. *Child Development*, 64(3), 830-847.
- González-Howard, M. (2019). Exploring the utility of social network analysis for visualizing interactions during argumentation discussions. *Science Education*, 103(3), 503-528.
- González-Howard, M., & McNeill, K. L. (2020). Acting with epistemic agency: Characterizing student critique during argumentation discussions. *Science Education*, 104(6), 953-982.
- Ladson-Billings, G. (2006). It's not the culture of poverty, it's the poverty of culture: The problem with teacher education. *Anthropology & Education Quarterly*, 37(2), 104-109.
- Lui, P. P., & Quezada, L. (2019). Associations between microaggression and adjustment outcomes: A meta-analytic and narrative review. *Psychological Bulletin*, 145(1), 45-78. <http://dx.doi.org/10.1037/bul0000172>
- Martin, D. B. (2019). Equity, inclusion, and antiblackness in mathematics education. *Race Ethnicity and Education*, 22(4), 459-478.
- McNeill, K. L. (2011). Elementary students' views of explanation, argumentation, and evidence, and their abilities to construct arguments over the school year. *Journal of Research in Science Teaching*, 48(7), 793-823.
- Mercer, N. (2000). *Words and minds: How we use language to think together*. London: Routledge.
- Miles, M. B., Huberman, A. M., & Saldana, J. (2014). *Qualitative data analysis: A methods sourcebook*. Thousand Oaks, CA: Sage Publications, Inc.
- Miller, E., Manz, E., Russ, R., Stroupe, D., & Berland, L. (2018). Addressing the epistemic elephant in the room: Epistemic agency and the next generation science standards. *Journal of Research in Science Teaching*, 55(7), 1053-1075.
- Milner, H. R. (2015). *Rac(e) ing to class: Confronting poverty and race in schools and classrooms*. Harvard Education Press.
- NGSS Lead States. (2013). *Next generation science standards: For states, by states*. Washington, DC: National Academies Press.
- Nasir, N. S., & Vakil, S. (2017). STEM-focused academies in urban schools: Tensions and possibilities. *Journal of the Learning Sciences*, 26(3), 376-406.
- Sampson, V., Enderle, P., Gleim, L., Grooms, J., Hester, M., Sutherland, S. A., & Wilson, K. (2014). *Argument-driven inquiry in biology: Lab investigations for grades 9-12*. Arlington, VA: NSTA Press.
- Sampson, V., & Schleigh, S. (2013). *Scientific Argumentation in Biology: 30 Classroom Activities*. Arlington, VA: NSTA Press.
- Stroupe, D. (2014). Examining classroom science practice communities: How teachers and students negotiate epistemic agency and learn science-as-practice. *Science Education*, 98(3), 487-516.

- Wagner, C. J., & González-Howard, M. (2018). Studying discourse as social interaction: The potential of social network analysis for discourse studies. *Educational Researcher*, 47(6), 375-383.
- Walton, D. (1998). *The new dialectic: Conversational contexts of argument*. Toronto, Canada: University of Toronto Press.
- Wigfield, A., & Cambria, J. (2010). Students' achievement values, goal orientations, and interest: Definitions, development, and relations to achievement outcomes. *Developmental Review*, 30(1), 1-35.