

A Bustling Inquiry-Oriented Math Environment: Who is Present and What is Happening?

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Inquiry-oriented (IO) instruction enables learners to discover and explore mathematics, actively engage in the classroom, ask questions, and construct their own knowledge (Kuster et al., 2018; Rasmussen & Kwon, 2007). Grounded in constructivist theories, inquiry-based mathematics education emphasizes the construction of knowledge through learners' interactions with their prior knowledge, peers, and instructor (Laursen & Rasmussen, 2019). These theoretical foundations are crucial for realizing IO's transformative potential for students' cognitive growth. However, we argue that these alone are insufficient given that IO environments and learners are dynamic and thus warrant careful consideration to inform thoughtful classroom design. In this poster, we explore a researcher's (Author 1) relationship with classroom data to consider how the material world participates in learning within an IO classroom. Drawing on new materialist and post-representational approaches, we aim to evoke new wonderings about IO instruction.

We drew on MacLure's (2013) proposal to encounter data that "glows," analyzing bodily responses and spontaneous interactions from two videotaped sessions of an undergraduate IO Calculus II course. By focusing on interactions among different agents in an IO class, we moved beyond traditional transcriptions and coding and instead identified significant material entanglements in the IO classroom that captured our interest. We decentered the teacher and students as the sole agents in the IO instruction, and acknowledged the agency of non-human entities that actively shout their presence in the classroom and contribute to facilitating learning (De Freitas & Sinclair, 2014). Kimmerer (2017) explained "...just because we don't think of them as humans doesn't mean they aren't beings" (p. 57). This idea, stemming from indigenous knowledges, prompts us to envision the possibilities of rich interactions that can exist between these "beings or becoming" (De Freitas & Sinclair, 2014) within the classroom environment.

We identified four "beings or becoming" that brought life into the IO classroom: (1) teaching and learning resources, (2) classroom practices, (3) students, and (4) teacher. Together, these emphasize that the bustling atmosphere is not only contributed to by the students and the teacher, but also by other non-human agents. As an example, a particular teaching and learning resource, Euler maps, served to engage students in conjecturing about sequences (Vroom et al., 2025). When observing the recording, we were struck by the unique invitation the maps extended to students, encouraging them to draw closer and approach learning with their own expressions, bodies, and physical movements. We saw some groups of students becoming more animated and using hand gestures on the Euler maps, while others maintained silence before interacting with their maps, and some students wrote on the adjacent blackboard. We could hear the bustling energy in the classroom through the intensity of the conversations happening around the maps. This leads us to wonder – in what ways can the IO classroom provide different opportunities for students' embodiments? In our poster, we will present our observations and corresponding wonderings, which could lead to reformulating theories for IO classrooms.

References

- De Freitas, E., & Sinclair, N. (2014). *Mathematics and the body: Material entanglements in the classroom*. Cambridge University Press.
- Kimmerer, R. (2017). Learning the Grammar of Animacy. *Anthropology of Consciousness*, 28, 128–134. <https://doi.org/10.1111/anoc.12081>
- Kuster, G., Johnson, E., Keene, K., & Andrews-Larson, C. (2018). Inquiry-Oriented Instruction: A Conceptualization of the Instructional Principles. *PRIMUS*, 28(1), 13–30. <https://doi.org/10.1080/10511970.2017.1338807>
- Laursen, S. L., & Rasmussen, C. (2019). I on the prize: Inquiry approaches in undergraduate mathematics. *International Journal of Research in Undergraduate Mathematics Education*, 5(1), 129–146. <https://doi.org/10.1007/s40753-019-00085-6>
- MacLure, M. (2013). Researching without representation? Language and materiality in post-qualitative methodology. *International Journal of Qualitative Studies in Education*, 26(6), 658–667. <https://doi.org/10.1080/09518398.2013.788755>
- Rasmussen, C., & Kwon, O. N. (2007). An inquiry-oriented approach to undergraduate mathematics. *The Journal of Mathematical Behavior*, 26(3), 189–194. <https://doi.org/10.1016/j.jmathb.2007.10.001>
- Vroom, K., Barbosa, J. S., & Lippert, A. (2025). How two undergraduates used examples and an Euler diagram for making and proving conjectures. *The Journal of Mathematical Behavior*, 79, 101259. <https://doi.org/10.1016/j.jmathb.2025.101259>