

DEVELOPING ARGUMENTATION PRACTICES FOR TEACHERS

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Mathematical argumentation is an important feature in the development of conceptual understanding for students (Osborne et al., 2019; Staples & Newton, 2016). Research has generally focused on how argumentation plays out in the classroom, with little focus on how teachers learn this complex work. This study explores teacher's understanding in facilitating argumentation and its implementation over time in the context of a professional development initiative. We address the following questions: How do teachers understand argumentation as a practice? How do teachers implement argumentation in their classrooms as they participate in the professional development? Our work is framed around an understanding that teacher learning is contextual, with a focus on interactions in the content (Greeno & Engeström 2014) and built off of teachers' practices (Kazemi and Hubbard, 2008). We consider argumentation as reasoning about a claim to build agreement across a community, as established by Knudsen et al. (2018).

Eight elementary teachers participated in Learning Labs (Gibbons et al., 2017), a series of monthly professional development sessions with interim support by coaches on implementing the practices. Each Learning Lab consisted of a cycle of new learning, planning a lesson using mathematical argumentation, enacting the lesson, and a debrief of the experience. Data included field notes from each Learning Lab, teachers' written reflections, and pre- and post-interviews for each teacher. We conducted cross-data analysis, with the sensitizing question of *how do teachers understand argumentation and how do they make plans to facilitate argumentation in their classrooms?* We analyzed perceptions and actions involving argumentation over the series of Learning Labs to understand moments of teacher insight and change regarding argumentation.

Findings show a change over time in teachers' understanding and facilitation of argumentation in practice. Early understandings focused on argumentation as explaining one's thinking. Teachers grappled with the distinction between explaining and justifying and with how to implement argumentation in the classroom (see Ghouseini et al., 2019). Over time, teachers developed more nuanced ideas of what counts as argumentation (making claims, providing evidence). Their new understandings helped them generate supports for students to participation in argumentation, ranging from claim comparisons to creating rough drafts of ideas. For example, one teacher worked to provide a set of claims for students to promote discussion that focused on justifying support or disagreement with each. Another teacher worked on language supports for argumentation and forms of modeling justification to move beyond students simply explaining a strategy. While the growth shown in teachers shows a more complex and practice-oriented understanding of argumentation, the differences across individual teachers represent the unique ways they connected to the professional development experiences. These findings show the effectiveness and significance of explicit and practice-oriented professional development for teachers' understanding of mathematical argumentation.

References

Gibbons, L., Kazemi, E., Hintz, A., & Hartmann, E. (2017). Teacher time out: Educators learning together in and through practice. *NCSM Journal*, 18(2), 28-46.

In: Sacristán, A.I., Cortés-Zavala, J.C. & Ruiz-Arias, P.M. (Eds.). (2020). *Mathematics Education Across Cultures: Proceedings of the 42nd Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*, Mexico. Cinvestav / AMIUTEM / PME-NA. <https://doi.org/10.51272/pmena.42.2020>

- Ghousseini, H., Kazemi, E., Prough, S., & Resnick, A.F. (2019). An investigation of teachers' sensemaking around facilitating mathematical argumentation. In Otten, S., Candela, A. G., de Araujo, Z., Haines, C., & Munter, C. (2019). Proceedings of the forty-first annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education (pp. 558-562). St Louis, MO: University of Missouri.
- Greeno, J. G., & Engeström, Y. (2014). Learning in Activity. In R. K. Sawyer (Ed.), (pp. 128-148). Cambridge: Cambridge University Press.
- Kazemi, E. & Hubbard, A. (2008). New directions for the design and study of professional development: Attending to the coevolution of teachers' participation across contexts. *Journal of Teacher Education*, 59(5), 428-441, doi: 10.1177/0022487108324330.
- Knudsen, J., Stevens, H., Lara-Meloy, T., Kim, H.-J., & Shechtman, N. (2018). *Mathematical Argumentation in Middle School: The What, Why, and How*. Thousand Oaks, CA: Corwin.
- Osborne, J. F., Borko, H., Fishman, E., Gomez Zaccarelli, F., Berson, E., Busch, K. C., et al. (2019). Impacts of a Practice-Based Professional Development Program on Elementary Teachers' Facilitation of and Student Engagement with Scientific Argumentation. *American Educational Research Journal*, 56(4), 1067-1112, doi:10.3102/0002831218812059.
- Staples, M., & Newton, J. (2016). Teachers' Contextualization of Argumentation in the Mathematics Classroom. *Theory into Practice*, 55(4), 294-301, doi:10.1080/00405841.2016.1208070.