

The Implications of Perspectives on MKT for the Examination of Teacher Noticing
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Mathematical knowledge for teaching (MKT) has been widely used in mathematics education research, with many researchers developing varying definitions. The categorization of MKT developed by Ball et al. (2008) has been influential in the study of teachers' mathematical knowledge. Their framework differentiates between pedagogical content knowledge and subject matter knowledge, and breaks these categories into subcategories that describe what the knowledge is of. While this categorization is helpful for characterizing the existence of knowledge it does not provide a mechanism for its development. The framework for MKT introduced by Silverman and Thompson (2008) does not categorize knowledge, but it does propose a potential mechanism for the development of MKT. The framework posits that MKT first begins with a personal understanding of a concept and then can be transformed into knowledge with pedagogical power via decentering. To transform their knowledge, a teacher must imagine how students might understand the content, and how students might be supported in developing an understanding consistent with that of the teacher.

While the use of student thinking in teaching has been examined in multiple ways, one particularly influential construct is professional noticing as defined by Jacobs and colleagues' (2010). They defined noticing to consist of attending to strategies, interpreting student understanding, and deciding how to respond on the basis of these understandings. A related idea is using decentering as a lens to analyze classroom practice (Bas-Ader & Carlson, 2021). When a teacher decenters they intentionally put aside their mathematical perspective and attempt to adopt the perspective of a student. They develop a mental model of their student's mathematics which informs their response to their student's thinking (Bas-Ader & Carlson, 2021).

Supporting graduate student instructors and new faculty in developing MKT and using student thinking is an important aspect of designing professional development programs. This poster will explore the affordances and constraints of using combinations of MKT frameworks and frameworks for the use of student thinking to study the relationship between MKT and teachers' use of student thinking. Using Ball, Hill, and colleagues' characterization of MKT could allow one to study relationships between teachers' knowledge in particular domains and their use of student thinking. One could map knowledge used when interpreting and responding to student thinking to domains of knowledge within the framework to understand how different domains support teachers in using student thinking. A teacher might draw on Knowledge of Content and Students to recognize a student understanding, and Knowledge of Content and Teaching to decide how to move that understanding forward. The use of Silverman and Thompson's framework aligns well with the use of decentering as a lens to examine teachers' use of student thinking. A teacher decenters to develop MKT, which supports them in decentering in the classroom. If a teacher has constructed ways that a student might understand an idea, they might assimilate a student's thinking to one of these ways. If a teacher encounters student thinking for which they do not have a viable pre-constructed model, they develop MKT as they decenter to build a model of their student's understanding. Thus, development of MKT and attention to student thinking can be seen as a reciprocal process, in which MKT supports teachers in making use of student thinking, and attending to student thinking can develop MKT.

References

- Ball, D. L., Thames, M. H., & Phelps, G. (2008). Content knowledge for teaching: What makes it special? *Journal of Teacher Education*, 59, 389-407.
- Baş-Ader, S., & Carlson, M. P. (2021). Decentering framework: A characterization of graduate student instructors' actions to understand and act on student thinking. *Mathematical thinking and learning*, 1-24. <https://doi.org/10.1080/10986065.2020.1844608>
- Jacobs, V. R., Lamb, L. L. C., & Philipp, R. A. (2010). Professional noticing of children's mathematical thinking. *Journal for Research in Mathematics Education*, 41(2), 169-202.
- Silverman, J., & Thompson, P. W. (2008). Toward a framework for the development of mathematical knowledge for teaching. *Journal of Mathematics Teacher Education*, 11, 499-511.