Developing a Framework for Mathematical Knowledge for Improving the Content Preparation of Elementary Teachers

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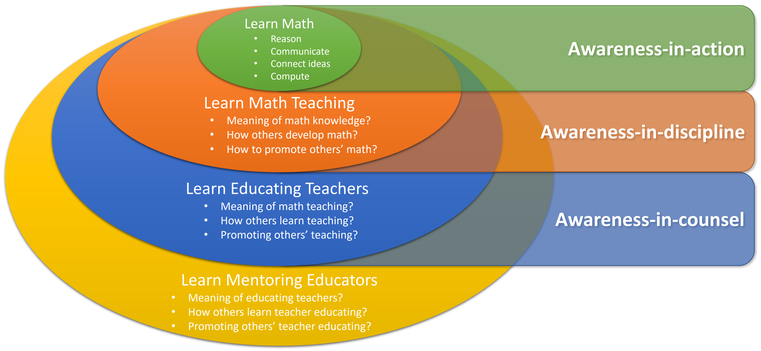
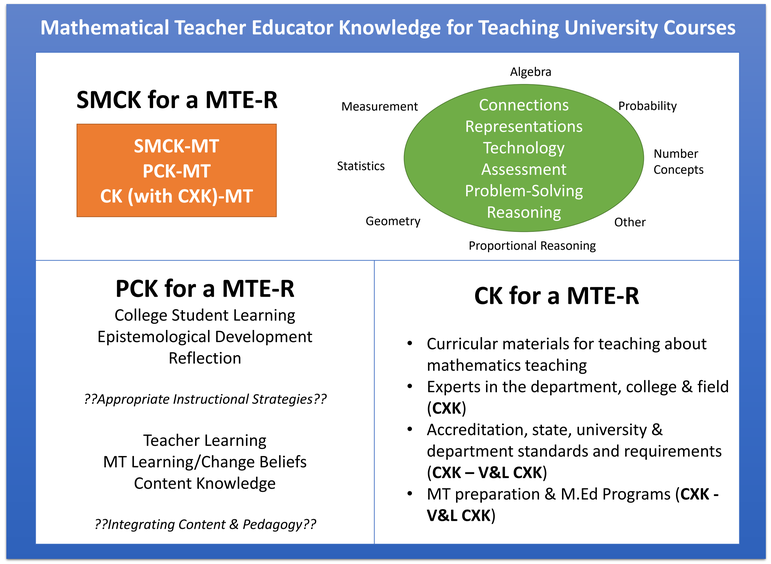


Tzur (2001) proposed a four-tier model of teacher educator development (left, in the ellipses), following a progressive hierarchy where each level of foci encompasses all prior levels. Tzur's framework aligns well with Mason's (1998) hierarchical levels of awareness in his vision for teacher educator development (right, in the tabs).



Chauvot (2009) expanded Shulman's (1986) framework for teacher knowledge to develop a knowledge map for MTEs. Her model follows the fractal metaphor as it is places all domains of knowledge for teaching within the subject matter content knowledge of MTE's (MTE-SMCK). Chavout's map is unique in that it considers how the context in which MTEs work, based on Grossman's (1990) knowledge of context (CXK), affects what they need to know. The model above only illustrates MTE knowledge in the context of teaching university courses.

References

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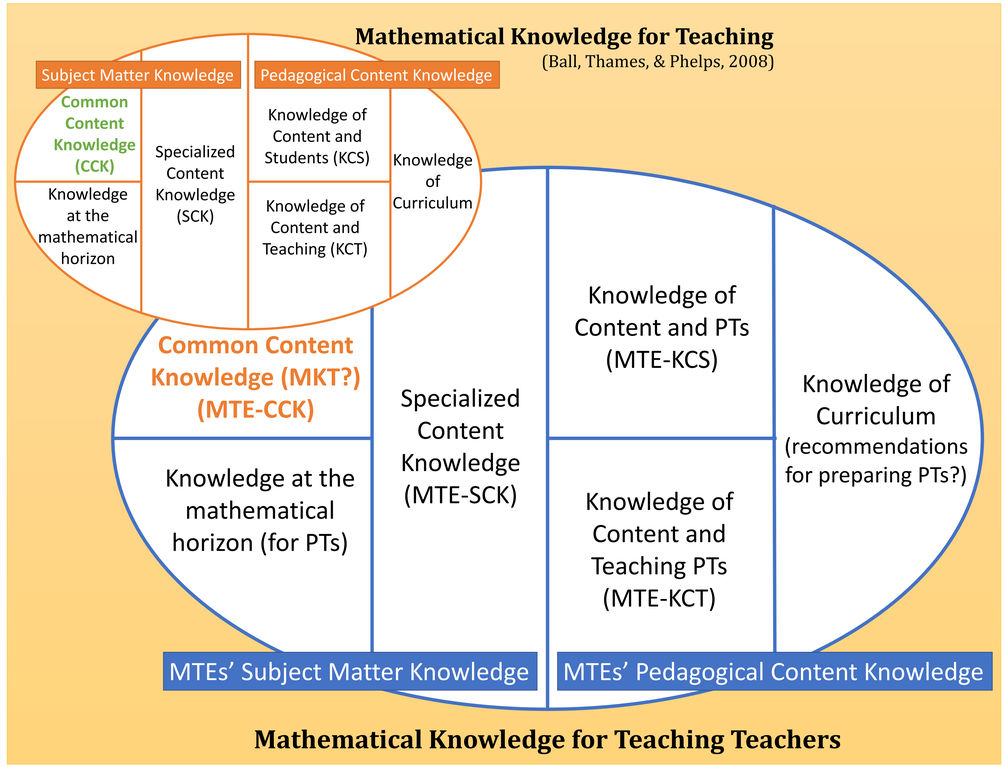
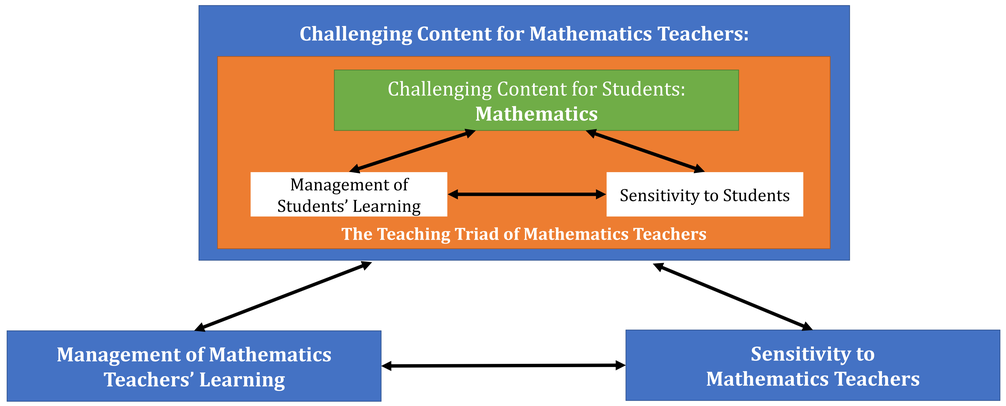
We aim to develop a theoretical foundation for the mathematical knowledge for teaching teachers (MKTT) by analyzing and synthesizing the existing literature on MTE knowledge through the lens of elementary mathematics content course development. We use "fractalization" as a metaphor for the many ways in which researchers are theorizing about MKTT, and apply this metaphor to explain many of the theoretical frameworks shown on this poster. The use of this metaphor, however, reveals some unexplored consequences of this framing. We apply this fractal metaphor to the Mathematical Knowledge for Teaching (MKT) (Ball, Thames, & Phelps, 2008) framework to see what happens when we try to define the analogous domains of MKT in terms of MKTT.

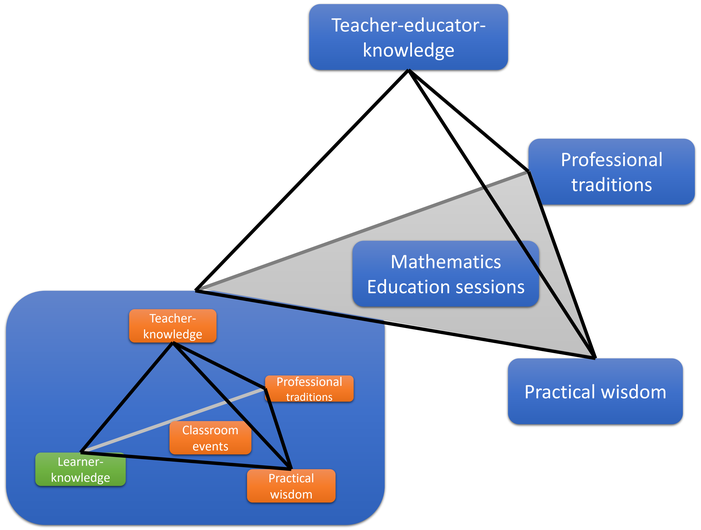




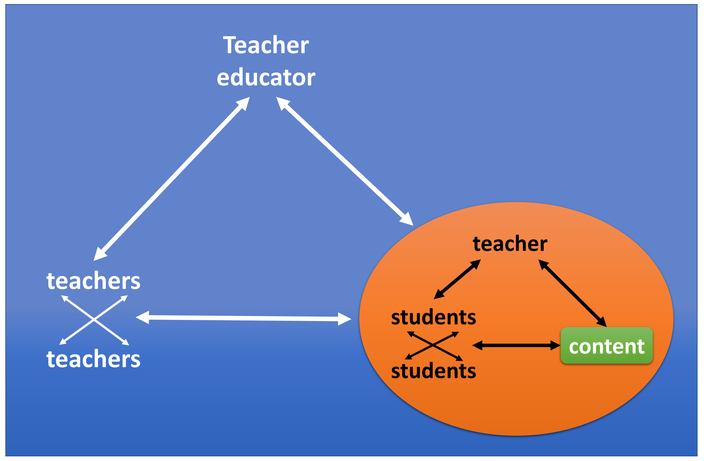
Zaslavky and Leikin fractalized Jaworski's model of the practice of teaching mathematics, known as "The Teaching Triad of Mathematics Teachers," to draw attention to the elements involved in creating opportunities for teachers to learn about the practice of teaching math. In developing their "Teaching Triad of Mathematics Teacher Educators," Jaworski's entire teaching triad for math teachers becomes the content to be learned by math teachers as students of teacher education.

Questions

- Is a fractal a good metaphor for how these bodies of knowledge are nested within each other?
- What are the affordances and constraints of using fractalization as a way of conceptualizing MKTT?
  - Where does MKT get categorized within the domains of MKTT?
  - Is MKT a proper **subset** of MKTT?
  - How can we start to define the domains of MKTT?
- How does MTEs' knowledge of research fit into a framework of MKTT?



Perks and Prestage (2008) used a fractal metaphor, as they included the "Teacher Knowledge Tetrahedron" (left) as the "Learner Knowledge" portion of their "Teacher-Educator Knowledge Tetrahedron."



Cohen, Raudenbush, & Ball (2003) offered a model of the instructional dynamics that affect student learning, highlighting the interactions between teachers and learners, their interactions with content, and the context in which the learning is taking place. Ball (2012) proposed expanding this model to consider the instructional dynamics surrounding the learning of teachers.