In 2010, Charalambous published an article that examined the relationship between mathematical knowledge for teaching (MKT) and task unfolding. As a result of this study, Charalambous found evidence to support the claim that there is a positive relationship between a teacher’s MKT and the cognitive level of task presentation and enactment. Drawing upon this finding, the purpose of this case study is to utilize unfolding and cognitive demand as a lens through which to examine mathematical knowledge for teaching at the undergraduate level. While MKT has been studied extensively at the K-12 level, there are relatively few studies that focus on MKT at the collegiate level. In order to help fill this gap, this case study first identifies how Precalculus instructors unfold examples that involve procedures and then examines the MKT that is involved in this unfolding.

**Keywords:** Mathematical Knowledge for Teaching, Cognitive Demand, Case Study, Precalculus, Examples, Procedures

Mathematical knowledge for teaching (MKT) has been defined as “the mathematical knowledge needed to perform the recurrent tasks of teaching mathematics to students” (Ball, Thames, & Phelps, 2008, p. 399). At the K-12 level, MKT has been studied extensively, but few studies exist at the collegiate level. The purpose of this study is to examine MKT at the collegiate level from the perspective of practice while still drawing upon previous research. In particular, Charalambous (2010) found that there was a positive relationship between teachers’ MKT and task unfolding. Charalambous used the MKT measurement developed by Ball for elementary teachers, the Mathematical Task Framework (Stein, Grover, and Henningsen, 1996, p. 469) to analyze the unfolding (i.e., selection, preparation, and enactment) of tasks, and the Task Analysis Guide (Stein & Smith, 1998) to analyze the cognitive demand. While it would be desirable to replicate this study to look for similar results at the collegiate level, no comparable measure of MKT exists. However, it is possible to use the Mathematical Task Framework and the Task Analysis Guide as lens to help examine what MKT at the collegiate level might look like.

Instead of examining collegiate MKT at large, this study focuses specifically on Precalculus examples that involve procedures. The larger purpose of this study is to contribute to research on Precalculus courses (Hastings, 2014; Saxe & Braddy, 2016). Examples were chosen as the specific task of teaching of interest because of their centrality to math instruction. Procedural knowledge is often characterized as superficial memorization of algorithms and therefore less important than conceptual knowledge. However, procedures are an integral part of mathematics and there is a need for students to develop deep procedural knowledge (Star, 2005) that is connected and requires high-level cognitive demand (Smith & Stein, 1998). This comparative case study seeks to answer the following research question: What mathematical knowledge do Precalculus instructors draw upon when selecting, presenting, and enacting examples that involve procedures? In order to answer this question, the Mathematical Task Framework will be used to analyze the unfolding of the examples while the Task Analysis Guide will be used to analyze cognitive demand. Finally, similar and different cases (in terms of the cognitive demand) will be compared in order to examine the MKT involved in unfolding examples.
References Cited


