A CONCEPTUALIZED FRAMEWORK FOR ASSESSING FACTORS THAT MAINTAIN AND LOWER COGNITIVE DEMAND DURING TASK ENACTMENT

Joshua M. Ruk
Western Michigan University
Jzf5431@wmich.edu

The National Council of Teachers of Mathematics (NCTM, 2014) has called for the use of cognitively demanding tasks. When using such tasks it is not only important that a task start out as cognitively demanding, but also that high cognitive demand is maintained during the task enactment; unfraternally, cognitive demand is often not maintained (Stein & Lane, 1996). To better understand this phenomenon, Stein, Grover, & Henningsen (1996) identified seven factors that help maintain, and six factors that lower cognitive demand during task enactments (Fig. 1). These factors have been used by numerous researchers who looked to understand what the maintenance of cognitive demands looks like (e.g. Hong & Choi, 2018; Lunt, 2011). But, the studies that use these factors don't discuss *how* they use the factors. They don't explain if they were just looking for the existence of the factors, or if they were coding the degree to which factors were applicable. As such, there is no reliable way to measure or compare what the maintenance of cognitive demand looks like within and across studies. The Instructional Quality Assessment (IQA; Boston, 2012) is a tool that could be used to help us to do this, but the IQA takes all 13 factors related to the maintenance of cognitive demand, and puts them on a single rubric with a four point scale. As such, it does not provide much detail about what each of the individual factors that maintains or lowers cognitive demand looks like during a task enactment.

To address the need for a tool that can provide a detailed analysis of how cognitive demand is maintained during task enactments, I conceptualized the **R**eorganized Factors that **U**ndermine or **K**eep Cognitive Demand (RUK). Looking at each factor individually, I found that many of the factors that lower and maintain cognitive demand are similar, and can be considered two ends of a continuum. This is true for nearly every factor, as can be seen by the continuums of the RUK (Fig. 1). For each continuum, the RUK provides a four point scale (available by contacting the author) to aid in the quantification of the factors that lower and maintain cognitive demand. By viewing these factors as two ends of a continuum, the RUK provides an efficient way to create a detailed analysis of what the maintenance of cognitive demand looks like during a task enactments. Additionally, the RUK provides a medium that can be used in subsequent research to allow *how* cognitive demand is maintained to be compared across different studies.

Factors that that maintain cognitive demand	Factors that lower cognitive demand	Factors combined on the RUK continuum
1) Tasks were built on students' prior knowledge	1) Task is inappropriate for the students	To what extent were students prepared to engage with this task?
2) Tasks were of the appropriate amount of time	2) Students are given too much or too little time to work on a task	To what extent was the amount of time students were given to work on this task appropriate?
3) High-level performance was modeled	3) The focus of the tasks shifts to finding a correct answer	To what extent are solution strategies discussed and important mathematical ideas and concepts uncovered?
4) The teacher sustained pressure for explanation and meaning	4) Lack of accountability	To what extent were students held accountable for explaining their thinking/reasoning?
5) Tasks had proper scaffolding	5) Challenges become nonproblems	To what extent did the teacher or more capable peers give away solution strategies in an attempt to help other?
	6) Classroom management problems	To what extent do classroom management issues occur during this task?
6) Student self-monitoring		To what extent can students provide evidence for their claims or explain their thinking?
7) The teacher drew conceptual connections		To what extent did the teacher draw conceptual connections?

Figure 1: Factors that Maintain and Lower Cognitive Demand (Derived from the work of Stein, Grover, & Henningsen, 1996) and their relationship to the RUK.

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