Element interactivity in bisecting lines and angles: Evidence from a real-time teaching episode

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Problems that involve reasoning continues to be a difficult area and the need to support students to conjecture and develop proof in the domain of geometry is well established (National Council of Teachers of Mathematics, 2000). While attempts have been made to understand schema development and activation in geometry (Chinnappan, 1998; Chinnappan & Lawson, 2015) the use of this knowledge to drive reasoning during problem solving has received less attention from a cognitive perspective. According to Cognitive Load Theory, instructional formats could impose three types of loads on the learner: Intrinsic Load (IL), Extrinsic Load (EL) and Germane Load (GL). Learning environments that are effective, efficient and deeply engaging should aim to draw on tasks that impose IL, use instructional formats that reduce EL and increase GL. IL is influenced by elements and interactivity among elements that are located in the learning task (Sweller, 2010). The higher the element interactivity in the task, the higher the associated IL on the working memory. The aim of this study is to a) analyse element interactivity in a geometry problem-solving task that involved the construction and bisection of lines and angles, b) examine how a teacher negotiates through these elements in the task during the course of teaching and c) analyse actions of the teacher in managing the three loads. Preliminary data from this lesson suggests that one way to make progress with issues of geometric reasoning is to better understand the elements and their interactivity as a prerequisite to designing effective instruction. I would also argue that the cognitive load research community need to use naturalistic learning environments such as in situ teaching contexts to explore the interplay between IL, EL and GL.