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*Reasoning about Functions of Two-Variables: A Case Study.*

I describe the results from a study investigating the conceptions and ways of thinking two second-semester calculus students developed during the course of a teaching experiment intended to foster powerful reasoning abilities about multivariable function. I reveal how two predominant means of thinking about function, shape thinking and axis thinking, supported and hindered students from developing a covariation view of two-variable functions. I discuss the importance of thinking about functions of one variable in a way that two-variable functions are coherent for both teacher and student. I conclude by discussing future directions of this line of inquiry, and discuss its necessity and importance for undergraduate mathematics education. (Received August 25, 2010)