The Role of Visualization in Teaching Undergraduate Mathematics:  
A Multicase Study of Teachers’ Perceptions and Practices

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Dissertation Abstract

It has been documented that students learn mathematics in different ways and through different learning styles. In particular, it has been found that some students prefer to understand and learn mathematics visually. Other researchers have determined that visual methods may be used by problem solvers in mathematics even in solutions that are deemed non-visual. Thus, the visual context appears to play a significant role in learning mathematics. But are instructors of mathematics aware of and responsive towards these needs? It is this question that I attempted to address in this study. More precisely, in this study I examined the use of visual strategies in the teaching of mathematics.

My intention was to study the use of such strategies from the instructors’ perspective. Thus, I selected five instructors in the mathematics department of a university who were teaching different courses in calculus. I observed several classes that they taught during one semester of the course and conducted interviews with them in order to understand their perceptions of teaching and mathematics. We also discussed several other issues related to teaching such as assessment and the role of visualization in teaching and learning mathematics. These observations and interviews delineated for me the teaching approaches of these instructors, and more specifically, how they used visual strategies in order to solve problems of instruction. An examination of the assessment tools used by the instructors with regard to the visual strategies used therein completed my examination of the instructors’ individual case studies.

I identified four primary visual teaching strategies and attempted to categorize the use of each of them for each instructor. My findings from this study indicated that while instructors used a wide range of visual instructional strategies, frequently blending several of them in one teaching episode, they often downplayed the role of such strategies in their classrooms. Based
on the study and the research in other similar areas, I made several suggestions for teaching and research in mathematics education.