

1096-M5-2634      **Paul E. Seeburger\*** (pseeburger@monroecc.edu), Monroe Community College, 1000 E. Henrietta Rd., Rochester, NY 14623. *To What Extent Does Visualization Improve Conceptual Understanding in Multivariable Calculus?*

An online exploration applet called CalcPlot3D allows students and instructors to create and freely rotate graphs of functions of two variables, contour plots, vectors, space curves, regions of integration, vector fields, parametric surfaces, and implicit surfaces. 3D glasses can be used for a real 3D perspective! Come get a pair and try it out! This applet has been used by over 1000 students from all over the country to complete various concept exploration activities that include a pre-test, an exploration for which students use the applet to explore a concept visually and answer provided questions, and a post-test. These explorations are intended to get students to "play" with the concepts visually. Topics for these concept explorations were the Dot Product, the Cross Product, Velocity and Acceleration Vectors (in the context of motion along a plane or space curve), and Lagrange Multiplier Optimization. The data presented will include analysis of these pre- and post-test results, student comments on their own learning from questions at the end of these explorations, and data from various other sources. CalcPlot3D is part of an NSF-funded grant project called Dynamic Visualization Tools for Multivariable Calculus (DUE-CCLI #0736968). See <http://web.monroecc.edu/calcNSF/>. (Received September 17, 2013)