1154-97-2627 **John F McClain*** (john.mcclain@unh.edu). *Sometimes Predicting the Future is Easier than Deciphering the Past and Other Aspects of Modeling the Draining of a Bottle.* Preliminary report.

I will share an activity focused on modeling the height of a fluid being drained from a bottle, adapted from one available on Simiode.org to work in my class of roughly 200 students, partly in the large lecture and partly in smaller recitations (20 students). I will also share the results of a student survey on modeling activities. This activity includes data collection from video (from Simiode), development of a regression model, derivation of a differential equation, solution of the differential equation, and interpretation of results. It ends with a common sense model verification that leads to a discussion of piecewise-defined solutions and lack of uniqueness for initial value problems corresponding to empty bottles. I emphasize the robustness of the differential equation to changing parameters in contrast to the regression model. I have found that the students appreciate the use of physical principles and geometric analysis in deriving the equation, however, they struggle with the use of the limit definition of derivative. Also, this model gives a physical example of an initial value problem without a unique solution: if the initial condition has height zero at time t_0, any solution describing a bottle emptying before t_0 also satisfies the initial condition. (Received September 17, 2019)