

“Am I Missing Something?”: Learning From Pre-Service Teachers’ Routes Through a Mathematical Modeling Cycle

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Mathematical modeling has been receiving increased focus with researchers identifying its benefits for students, such as using mathematics in real-world applications and affecting change in attitudes towards mathematics (Maaß, 2006; Stender & Kaiser, 2016). Mathematical modeling also provides the opportunity to support equitable learning by promoting cooperation among students from various mathematical backgrounds with the use of low-floor and high-ceiling tasks (Cirillo et al., 2016). With so many potential benefits, it is important to examine how groups of pre-service math teachers (PSMTs) negotiate the modeling process in order to better prepare them to include modeling activities in their future classrooms.

Modeling is a complex process, with participants needing to connect mathematical concepts with real-world contexts that are not well defined. There have been several modeling cycles published (e.g., Bliss et al., 2014; Blum & Ferri, 2009) that attempt to illustrate how individuals move through the various modeling phases. However, the modeling cycles tend to provide a simplified view of the “messy” and complex nature of these tasks (Albarracín et al., 2019). To gain insight into the modeling process, we planned and taught two mathematical modeling sessions for 24 PSMTs in a combined bachelor’s and master’s level mathematics teacher education course. This work enabled us to explore how small groups of PSMTs moved between phases of the Bliss et al. (2014) modeling cycle: *building the model*, *getting a solution*, *analysis and model assessment*, and *reporting results*. The research questions guiding this study are: How does PSMTs’ engagement in a modeling task align with and differ from the Bliss et al. (2014) modeling cycle? What is the context that is taking place as PSMTs deviate from this cycle?

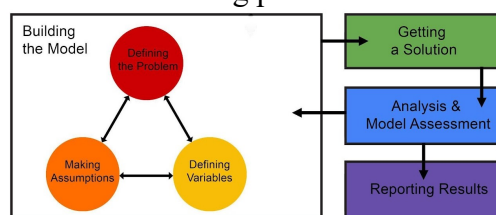


Figure 1. A Modeling Cycle Adapted From Bliss et al. (2014)

In our analysis, we used a modified version of the Modeling Activity Diagram (MAD) framework (Ärleback, 2009) to create a visual representation of each group’s movements through the modeling cycle phases. Several different types of deviations from the Bliss et al. (2014) modeling cycle were observed. For example, students moved from *getting a solution* back to the *building the model* phase due to a need to make additional assumptions based on their model choices. We explore the causes for such deviations and discuss how this process is more complex than the cycles suggest when PSMTs engage in these tasks within the classroom. These insights can be used to help prepare PSMTs to teach mathematical modeling.

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