

Mathematical Modeling Monograph

The Common Core State Standards for Mathematics modeling standard describes five different actions that students take over the course of a complete modeling task:

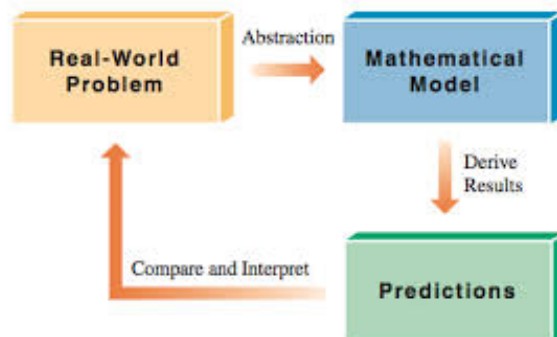
1. Identifying essential variables in a situation
2. Formulating models from those variables
3. Performing operations using those models
4. Interpreting the results of those operations
5. Validating the conclusions of those results

Pearson high school math will incorporate this mathematical modeling standard in each of its topics providing students with deep modeling tasks. Each task will be introduced via a video that is intended to hook the student into the task. It poses a question that is very short, that features little academic language and that leads to a guess as well as more questions. Students then proceed to gather the information needed to solve the task and begin the modeling process. Teachers should act as a resource here including someone who can explain the differences between models and can demonstrate procedures. The finally step of the modeling process confirms the answer to the modeling task in the world itself but is not an answer key. It requires a conversation about sources of error. Why was our answer close but not exact? What did our model not include that it should have? What did our model include that it shouldn't have?

The table below illustrates the distinction between typical mathematical modeling in most textbooks and our approach in Pearson high school math.

Typical Textbook Modeling	Pearson HS math Modeling Lessons
Problem starts with written text on the page.	Problem starts with video of the situation with limited or no text.
Variables are given	Students identify variables
Model is usually given	Students discover the model with teacher support
Model has no error and answer is provided by teacher or textbook with limited reflection.	Students validate conclusions and reflect on sources of error in their model

Moreover, our Pearson high school math modeling tasks present problem solving in a genuine way and demonstrate that such is a creative, iterative process often resulting in multiple answers that need to be evaluated in the real world. During the mathematical modeling process, students are engaged in many (if not all) of the mathematical practices especially MP1, 4, 5 (Make sense of problems and persevere in solving them, model with mathematics, and using appropriate tools). The graphic below of the mathematical modeling process illustrate how the MPs are emphasized throughout the modeling process. (I want to add the MPs on the arrows in the graphic below.)



Note that mathematical modeling differs from typical problem solving. As in mathematical modeling, the tasks are embedded in the real world and require problem formulating before problem solving. Once the problem is solved, the student moves back into the real world where the results are analyzed in context. It is only through such genuine tasks that students will reach the mathematical modeling standard that the Common Core State Standards for Mathematics have outlined.