Vertical Alignment of Scientific and Engineering Practice: Developing and Using Models and Prototypes

TEKS in Focus highlights key concepts and student expectations to assist educators in implementing the Texas Essential Knowledge and Skills (TEKS) in science. The vertical progression of a concept within the science TEKS is presented, along with detailed explanations from the TEKS Guide. The scientific and engineering practices are the first strand of the science TEKS. To create a cohesive learning experience, educators should integrate scientific and engineering practices with content. Embedding these practices in the content provides students with the context to ask questions, develop models, and analyze data. This approach ensures that students develop critical thinking and problem-solving skills by applying scientific and engineering practices to real-world scenarios as they learn the content.

Detailed explanations are provided for the underlined terms and phrases in each student expectation. Detailed explanations call out a specific word or phrase in a student expectation to clarify what students should know and be able to do in reference to that word or phrase. Detailed explanations may include an instructional boundary that specifies Tier 1 (baseline) instructional expectations for all students.

Scientific and Engineering Practice 2A

Science TEKS	Term or Phrase	Detailed Explanations from TEKS Guide
K.2.A, 1.2.A, 2.2.A *identify **basic advantages and limitations of models** such as their size, properties, and materials;*	**basic advantages and limitations of models**	Students should understand that all models have strengths and weaknesses, and that recognizing these limitations helps them select the most appropriate model for the situation. In the kindergarten through grade 2 band, students should also be able to discuss ways a given model may or may not resemble the correct size or material, or may not provide complete data.
3.2.A, 4.2.A, 5.2.A, 6.2.A, 7.2.A, 8.2.A, BIO.2.A, IPC.2.A, CHEM.2.A, PHYS.2.A *identify **advantages and limitations of models** such as their size, scale, properties, and materials;*	**advantages and limitations of models**	**Grades 3–5:** Students in grades 3–5 should have experiences with models used to represent small-scale objects and events, as well as models that represent large-scale objects and events within the grade-level content standards. Students should consider the advantages and disadvantages of a model's use, accuracy, and design. **Grades 6–12:** Students in grades 6–12 should use and create models that represent objects, phenomena, and processes on multiple scales. Students should consider the advantages and disadvantages of a model's use, accuracy, and design.

TEKS Guide Glossary Terms (found in one or more student expectations of this vertical alignment):
Glossary terms and definitions in the TEKS Guide are consistent from kindergarten through high school. The definitions provide educators with a common understanding of the terms, regardless of the grade level they teach. Glossary definitions are not intended for use with students.

data: factual information (such as observations, measurements, or statistics) used as a basis for reasoning, discussion, or calculation; often includes both useful and irrelevant or redundant information and must be processed to be meaningful

property: a characteristic of matter that can be used to identify particular materials

scale: a ratio between two sets of measurements

TEKS Guide Further Explanation:
The further explanation section is intended to serve as a resource to help educators better understand the topic their students are studying. Further explanations may be written at a level more complex than what is expected for students at that grade level.

The following further explanation appears in kindergarten through grade 12:

All models have strengths and weaknesses; understanding those limitations helps scientists and engineers select the most appropriate model. The advantages of models may include seeing something that would otherwise be too big (the solar system) or too small (bacteria), manipulating the parts to see how they work together, and using less expensive or easier-to-find materials to build it. Disadvantages of models may include limited accuracy in representing the phenomena they model.

Teachers may use a Plus, Minus, Delta chart or another graphic organizer to help students think about and discuss the strengths and weaknesses of models.

Plus (+)	Minus (-)	Delta (Δ)