Vertical Alignment of Scientific and Engineering Practice: Conducting Investigations and Designing Solutions

TEKS in Focus highlights key concepts and student expectations to assist educators in implementing the science Texas Essential Knowledge and Skills (TEKS). The vertical progression of a concept within the science TEKS is provided along with the detailed explanations provided in TEKS Guide. The science TEKS include scientific and engineering practices in strand one. To create a cohesive learning experience, educators should integrate scientific and engineering practices with content. Embedding these practices into the content provides students with the context in which 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 in real-world scenarios while learning the content.

Detailed explanations are provided for bold words in the 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 1B

Science TEKS	Term or Phrase	Detailed Explanations from TEKS Guide
K.1.B, 1.1.B, 2.1.B use scientific practices to plan and conduct simple descriptive investigations and use **engineering practices to design solutions** to problems;	**engineering practices to design solutions**	K–2: Students will design solutions to engineering problems by using the engineering design process (identify, imagine, plan, create, and improve). In kindergarten through grade 2, it is most appropriate for teachers to provide the problem along with the criteria and constraints. Students may work individually and in collaborative groups to imagine, plan, and create a solution to the problem by creating a prototype.
3.1.B, 4.1.B use scientific practices to plan and conduct descriptive investigations and use **engineering practices to design solutions** to problems 5.1.B use scientific practices to plan and conduct descriptive and simple experimental investigations and use **engineering practices to design solutions** to problems;	**engineering practices to design solutions**	3–5: Students will design solutions to engineering problems by using the engineering design process (identify, imagine, plan, create, and improve). In grades 3–5, it is most appropriate for teachers and students to work together to define the problem along with criteria and constraints. Students may work individually and in collaborative groups to imagine, plan, and create a solution to the problem by creating a prototype.
6.1.B ,7.1.B, 8.1.B use scientific practices to plan and conduct descriptive, comparative, and experimental investigations and **use engineering practices to design solutions** to problems;	**engineering practices to design solutions**	Students will design solutions to engineering problems by using the engineering design process (identify, imagine, plan, create, and improve). In grades 6–8, it is most appropriate for students to define the problem and for students and teachers to work together to define criteria and constraints. Students work individually and in collaborative groups to imagine, plan, and create a solution to the problem by creating a prototype.

Scientific and Engineering Practice 1B Continued

Science TEKS	Term or Phrase	Detailed Explanations from TEKS Guide
Bio.1.B, IPC.1.B, Chem.1.B, Phys.1.B apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use **engineering practices to design solutions** to problems;	**engineering practices to design solutions**	Students will design solutions to engineering problems by using the engineering design process (identify, imagine, plan, create, and improve). Students will define the problem and students and teachers work together to define criteria and constraints. Students will work in collaborative groups to imagine, plan, and create a solution to the problem by creating a prototype.

TEKS Guide Glossary Terms:

Glossary terms and definitions are consistent across kindergarten through high school in the TEKS Guide. The definitions are intended to give educators a common understanding of the terms regardless of what grade level they teach. Glossary definitions are not intended for use with students.

descriptive investigation: a type of investigation that involves simple observations to understand and explain a process or behavior

experimental investigation: a type of investigation that involves a test with identified variables (independent, dependent, and controlled) to observe the relationship between the independent and dependent variables

comparative investigation: a type of investigation that involves comparing a process or behavior in two different settings

TEKS Guide Further Explanation:

The further explanation is designed to be a resource for educators that helps them better understand the topic their students are learning. Further explanations may be written at a more complex level than would be expected for students at the grade level.

Engineering practices include using the engineering design process to solve problems. Students engage with integrated concepts from multiple disciplines and use design thinking to design a solution to an authentic problem. There are multiple model variations of the engineering design process; however, they all share the basic practices of asking questions or defining problems, brainstorming, planning, creating and testing a design, and improving the design. Throughout the process, students are engaged in problem-solving, teamwork, collaboration, and effective communication.

The engineering design process is non-linear and iterative. Flexibility within the engineering design process allows a student to return to a step if needed. Analysis and improvement often result in additional questions or problems that can be solved through additional design process iterations.
