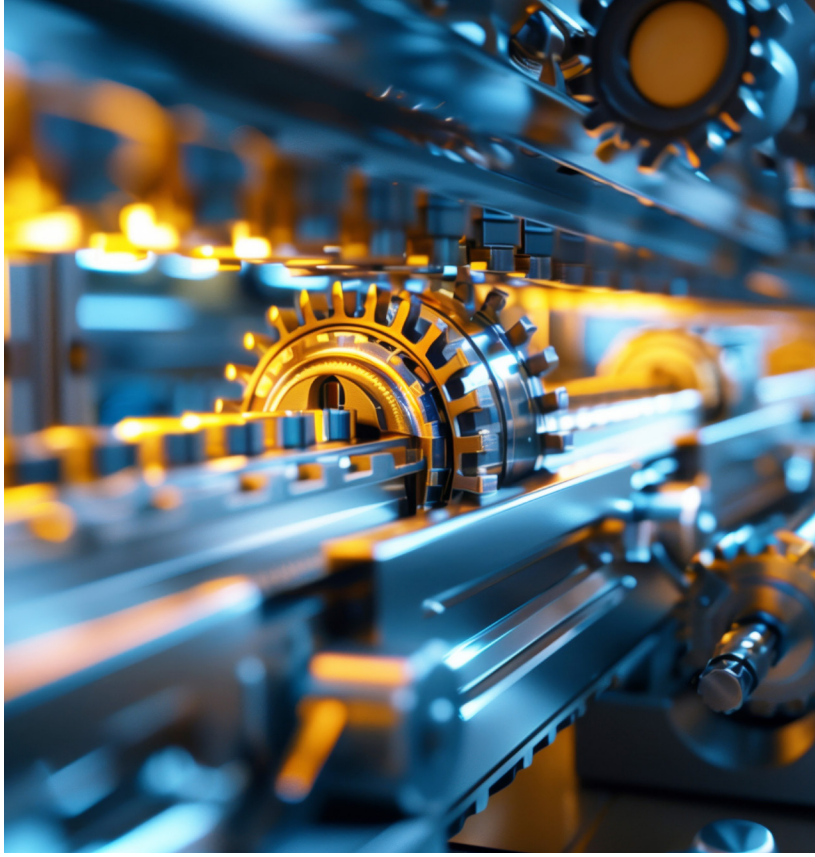

SCIENTIFIC AND ENGINEERING PRACTICES

Ask Questions

Scientists **explore phenomena** (observable events or processes) to gain a deeper understanding of the natural world. Scientists **ask questions** about how or why phenomena occur to plan investigations that lead to evidence-based explanations.

Define Problems

Engineers **solve real-world problems** and **explore** the world around them. Engineers **identify a problem** or opportunity to **improve a solution** based on engineering-focused questions that define a problem with a purpose, constraints, and criteria for success.

Adapted from the science Texas Essential Knowledge and Skills (TEKS)

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SCIENTIFIC AND ENGINEERING PRACTICES

Investigate

Scientists **plan and conduct investigations** to observe and test questions about a phenomenon. Scientists consider which tools and safety practices will be most effective in **providing evidence** for their investigation.

Design Solutions

Engineers **collaborate** with their peers through the design process, evaluating others' solutions and justifying their own using the design criteria and evidence. Engineers use the engineering design process to **solve problems** by designing prototypes or processes to design solutions. Engineers use their knowledge of materials and their properties, phenomena, content, and safety procedures to inform design solutions.

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SCIENTIFIC AND ENGINEERING PRACTICES

Collect & Organize Data

Scientists **collect data** during investigations to understand a phenomenon, including how a phenomenon is affected by changes. Scientists **record descriptions** and drawings of phenomena and **organize measurements** into tables and graphs. Scientific explanations depend on well-organized and high-quality (valid and reliable) data.

Adapted from the science Texas Essential Knowledge and Skills (TEKS)

Collect & Organize Data

Engineers **collect and use data** to inform the development of a prototype design, test how well a prototype meets the expected criteria, and drive improvements to their design. When collecting data, engineers **organize information** in spreadsheets, tables, or charts for later analysis.

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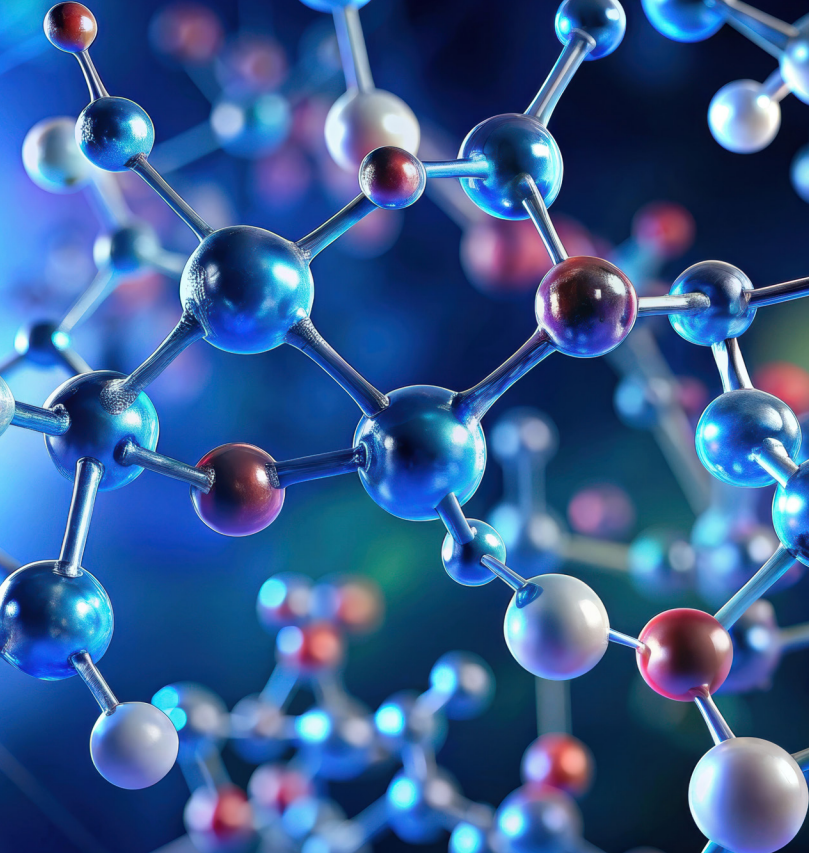

SCIENTIFIC AND ENGINEERING PRACTICES

Use Models

Scientists use physical, conceptual, and mathematical models to **simplify and represent complex systems**. Models enable scientists to understand how systems and processes work and how their parts interact. Scientists use models to simulate scenarios, test ideas, and interpret patterns and relationships in data. Evidence from models is used to explain scientific concepts.

Design Prototypes

Engineers work through the engineering design process to **develop prototypes** as working models that solve the identified problem. Engineers determine if their prototypes are successful by evaluating their design based on the design criteria.

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SCIENTIFIC AND ENGINEERING PRACTICES

Analyze Data

Scientists **analyze observations and measurements** to determine whether patterns, trends, and relationships exist within the data. Careful analysis of data can help answer a question or determine whether an idea is supported. Scientists let the data guide their conclusions, even if the results are unexpected.

Analyze Data

Engineers **analyze data** from their testing phase to determine how well a solution meets the expected criteria and to compare solutions to problems. Data analysis determines how efficient and effective a solution is to meeting the needs of an engineering problem.

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SCIENTIFIC AND ENGINEERING PRACTICES

Communicate Explanations

Scientists communicate their findings to help others understand what they observed, what they learned from the data, and whether it supports their original question or claim. Scientists **share their evidence, reasoning, and explanations** to help others learn, ask new questions, and improve scientific understanding.

Communicate Solutions

Engineers communicate designed solutions to an audience. Engineers **use their evidence, reasoning, writing, and presenting skills** to persuade a user that their design is the most efficient and effective.

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