Engineering, Technology & Applications of Science

The following is paraphrased from the Framework pgs. 201-203

Any science education that focuses predominantly on the detailed products of scientific labor—the facts of science—without developing an understanding of how those facts were established or that ignores the many important applications of science in the world misrepresents science and marginalizes the importance of engineering. This statement has two implications for science education standards in general and for the framework in particular. The first is that students should learn how scientific knowledge is acquired and how scientific explanations are developed. Dimension 1: Scientific & Engineering Practices focuses on this process.The second is that students should learn how science is utilized, in particular through the engineering design process, and they should come to appreciate the distinctions and relationships between engineering, technology, and applications of science (ETS). These three terms are defined below.

- **Technology** is any modification of the natural world made to fulfill human needs or desires.
- **Engineering** is a systematic and often iterative approach to designing objects, processes, and systems to meet human needs and wants.
- An **application of science** is any use of scientific knowledge for a specific purpose, whether to do more science; to design a product, process, or medical treatment; to develop a new technology; or to predict the impacts of human actions.

Dimension 1: Scientific & Engineering Practices describes how an understanding of engineering practices can develop as they are used in the classroom to help students acquire and apply

science knowledge.

The fields of science and engineering are mutually supportive. New technologies expand the reach of science, allowing the study of realms previously inaccessible to investigation; scientists depend on the work of engineers to produce the instruments and computational tools they need to conduct research. Engineers in turn depend on the work of scientists to understand how different technologies work so they can be improved; scientific discoveries are exploited to create new technologies in the first place. Scientists and engineers often work together in teams, especially in new fields, such as nanotechnology or synthetic biology that blur the lines between science and engineering. Students should come to understand these interactions and at increasing levels of sophistication as they mature. Their appreciation of the interface of science, engineering, and society should give them deeper insights into local, national, and global issues.

Core and Component Ideas in the Engineering, Technology & Applications of Science

Each core and component idea below is linked to the relevant section of the online Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas to provide additional background and grade band end points for each component.

- Core Idea ETS1: Engineering Design
  - ETS1.A: Defining and Delimiting an Engineering Problem
  - ETS1.B: Developing Possible Solutions
  - ETS1.C: Optimizing the Design Solution
- Core Idea ETS2: Links Among Engineering, Technology, Science, and Society
  - ETS2.A: Interdependence of Science, Engineering, and Technology
  - ETS2.B: Influence of Engineering, Technology, and

Science on Society and the Natural World