Nature of Science Standards
Eagle Ridge Academy

9.1.1.1.2
Understand that scientists conduct investigations for a variety of reasons, including: to discover new aspects of the natural world, to explain observed phenomena, to test the conclusions of prior investigations, or to test the predictions of current theories.

9.1.1.1.3
Explain how the traditions and norms of science define the bounds of professional scientific practice and reveal instances of scientific error or misconduct. *For example:* The use of peer review, publications and presentations.

9.1.1.1.4
Explain how societal and scientific ethics impact research practices. *For example:* Research involving human subjects may be conducted only with the informed consent of the subjects.

9.1.1.1.5
Identify sources of bias and explain how bias might influence the direction of research and the interpretation of data. *For example:* How funding of research can influence questions studied, procedures used, analysis of data, and communication of results.

9.1.1.1.6
Describe how changes in scientific knowledge generally occur in incremental steps that include and build on earlier knowledge.

9.1.1.1.7
Explain how scientific and technological innovations-as well as new evidence-can challenge portions of, or entire accepted theories and models including, but not limited to: cell theory, atomic theory, theory of evolution, plate tectonic theory, germ theory of disease, and the big bang theory.

9.1.1.2.1
Formulate a testable hypothesis, design and conduct an experiment to test the hypothesis, analyze the data, consider alternative explanations, and draw conclusions supported by evidence from the investigation.

9.1.1.2.2

Evaluate the explanations proposed by others by examining and comparing evidence, identifying faulty reasoning, pointing out statements that go beyond the scientifically acceptable evidence, and suggesting alternative scientific explanations.

9.1.1.2.3

Identify the critical assumptions and logic used in a line of reasoning to judge the validity of a claim.

9.1.1.2.4

Use primary sources or scientific writings to identify and explain how different types of questions and their associated methodologies are used by scientists for investigations in different disciplines..

9.1.2.1.1

Understand that engineering designs and products are often continually checked and critiqued for alternatives, risks, costs and benefits, so that subsequent designs are refined and improved. *For example:* If the price of an essential raw material changes, the product design may need to be changed.

9.1.2.1.2

Recognize that risk analysis is used to determine the potential positive and negative consequences of using a new technology or design, including the evaluation of causes and effects of failures. *For example:* Risks and benefits associated with using lithium batteries.

9.1.2.1.3

Explain and give examples of how, in the design of a device, engineers consider how it is to be manufactured, operated, maintained, replaced and disposed of.

9.1.2.2.1

Identify a problem and the associated constraints on possible design solutions. *For example:* Constraints can include time, money, scientific knowledge and available technology.

9.1.2.2.2

Develop possible solutions to an engineering problem and evaluate them using conceptual, physical and mathematical models to determine the extent to which the solutions meet the design specifications. *For example:* Develop a prototype to test the quality, efficiency and productivitiy of a product.

9.1.3.1.1
Describe a system, including specifications of boundaries and subsystems, relationships to other systems, and identification of inputs and expected outputs. *For example:* A power plant or ecosystem.

9.1.3.1.2
Identify properties of a system that are different from those of its parts but appear because of the interaction of those parts.

9.1.3.1.3
Describe how positive and/or negative feedback occur in systems.
***For example:* The greenhouse effect**

9.1.3.2.1
Provide examples of how diverse cultures, including natives from all of the Americas, have contributed scientific and mathematical ideas and technological inventions.
***For example:* Native American understanding of ecology; Lisa Meitner's contribution to understanding radioactivity; Tesla's ideas and inventions relating to electricity; Watson, Crick and Franklin's discovery of the structure of DNA; or how George Washington Carver's ideas changed land use.**

9.1.3.2.2
Analyze possible careers in science and engineering in terms of education requirements, working practices and rewards.

9.1.3.3.1
Describe how values and constraints affect science and engineering.
***For example:* Economic, environmental, social, political, ethical, health, safety, and sustainability issues.**

9.1.3.3.2
Communicate, justify, and defend the procedures and results of a scientific inquiry or engineering design project using verbal, graphic, quantitative, virtual, or written means.

9.1.3.3.3
Describe how scientific investigations and engineering processes require multi-disciplinary contributions and efforts. *For example:* Nanotechnology, climate change, agriculture, or biotechnology.

9.1.3.4.1

Describe how technological problems and advances often create a demand for new scientific knowledge, improved mathematics, and new technologies.

9.1.3.4.2

Determine and use appropriate safety procedures, tools, computers and measurement instruments in science and engineering contexts. *For example:* Consideration of chemical and biological hazards in the lab.

9.1.3.4.3

Select and use appropriate numeric, symbolic, pictorial, or graphical representation to communicate scientific ideas, procedures and experimental results.

9.1.3.4.4

Relate the reliability of data to consistency of results, identify sources of error, and suggest ways to improve the data collection and analysis. *For example:* Use statistical analysis or error analysis to make judgments about the validity of results

9.1.3.4.5

Demonstrate how unit consistency and dimensional analysis can guide the calculation of quantitative solutions and verification of results.

9.1.3.4.6

Analyze the strengths and limitations of physical, conceptual, mathematical and computer models used by scientists and engineers.