Grade 7

I. Inquiry

A. Abilities Necessary to do Scientific Inquiry

1. Identify process skills that can be used in scientific investigations.

a. Observe
   1. Observe patterns of objects and events.
   2. Distinguish between qualitative and quantitative observations.

b. Classify
   1. Arrange data in sequential order.
   2. Use scientific (e.g., field guides, charts, periodic tables, etc.) and dichotomous keys for classification.

c. Measure
   1. Select and use appropriate tools (e.g., metric ruler, graduated cylinder, thermometer, balances, spring scales, stopwatches) and units (e.g., meter, liter, Celsius, gram, Newton, second) to measure to the unit required in a particular situation.
   2. Select and use appropriate metric prefixes to include milli-, centi-, and kilo-.

d. Infer
   1. Make inferences based on observations.

e. Predict
   1. Predict the results of actions based on patterns in data and experiences.

2. Design and conduct a scientific investigation.

a. Recognize potential hazards within a scientific investigation and practice appropriate safety procedures.
b. Pose questions and problems to be investigated.
c. Obtain scientific information from a variety of sources (such as Internet, electronic encyclopedias, journals, community resources, etc.).
d. Distinguish and operationally define independent (manipulated) and dependent (responding) variables.

e. Manipulate one variable over time with repeated trials and controlled conditions.
f. Collect and record data using appropriate metric measurements.
g. Organize data in tables and graphs.
h. Analyze data to construct explanations and draw conclusions.

3. Use appropriate tools and techniques to gather, analyze, and interpret data.

   a. Select and use appropriate tools and technology (such as calculators, computers, probes, thermometers, balances, spring scales, microscopes, binoculars, and hand lenses) to perform tests, collect data, and display data.
   b. Analyze and interpret data using computer hardware and software designed for these purposes.

4. Develop descriptions, explanations, predictions, and models using evidence.

   a. Discriminate among observations, inferences, and predictions.
   b. Construct and/or use models to carry out/support scientific investigations.

5. Think critically and logically to make relationships between evidence and explanations.

   a. Review and summarize data to show cause-effect relationships in experiments.
   b. State explanations in terms of independent (manipulated) and dependent (responding) variables.
   c. State hypotheses in ways that include the independent (manipulated) and dependent (responding) variables.

6. Recognize and analyze alternative explanations and predictions.

   a. Analyze different ideas and explanations to consider alternative ideas.
   b. Accept the skepticism of others as part of the scientific process.

7. Communicate scientific procedures and explanations.

   a. Use drawings, written and oral expression to communicate information.
   b. Create drawings, diagrams, charts, tables, and graphs to communicate data.
   c. Interpret and describe patterns of data on drawings, diagrams,

charts, tables, graphs, and maps.
d. Create and/or use scientific models to communicate information.

8. Use mathematics in all aspects of scientific inquiry.

a. Use mathematics to gather, organize, and present data.
b. Use mathematics to structure convincing explanations.

B. Abilities Necessary to Do Technological Design

1. Identify appropriate problems for technological design.

a. Identify a specific need for a product.
b. Determine whether the product will meet the specified need.

2. Design a solution or product.

a. Compare and contrast different proposals using selected criteria (e.g., cost, time, trade-off, materials needed).
b. Communicate ideas with drawings and simple models.

3. Implement a proposed design.

a. Select suitable tools and techniques to ensure adequate accuracy.
b. Organize materials, devise a plan, and work collaboratively where appropriate.

4. Evaluate completed technological designs or products.

a. Measure the quality of the product based on the original purpose or need and the degree to which it meets the needs of the users.
b. Suggest improvements and try proposed modifications to the design.

5. Communicate the process of technological design.

a. Identify the four stages of problem solving: problem identification, solution design, implementation, and evaluation.

C. Understandings about Science and Technology

1. Scientific inquiry and technological design have similarities and differences.

    a. Compare and contrast scientific inquiry and technological design.

2. Many different people in different cultures have made and continue to make contributions to science and technology.

    a. Describe examples of contributions people have made to science and technology. (H, N)

3. Science and technology are reciprocal.

    a. Explain how science and technology are essential to each other. (T)

4. Perfectly designed solutions do not exist.

    a. Discuss factors that affect product design and alter the original design. (T)
    b. Discuss risk versus benefit factors in product design. (P)

5. Technological designs have constraints.

    a. Describe examples of constraints on technological designs. (T)
    b. Explain why constraints on technological design are unavoidable. (T, N)

6. Technological solutions have intended benefits and unintended consequences.