Anoka-Hennepin Secondary Curriculum Unit Plan

Department:	Science	Course:	Science 7 (Life Science)	Unit 1 Title:	Nature of Science and Engineering	Grade Level(s):	7th Grade
Assessed Trimester:	Trimester 1	Pacing:	30-35 Days	Date Created:	6/7/2012	Last Revision Date:	6/24/14

Course Understandings: *Students will understand that:*

- Scientific inquiry is a continuous cycle of asking and seeking answers to questions about the natural world.
- Evidence gathered from the past is used to explain the origination of an event, phenomenon, species, system, and to help predict the future.
- The process of technology uses scientific knowledge to design solutions to real-world problems.

DESIRED RESULTS (Stage 1) - WHAT WE WANT STUDENT TO KNOW AND BE ABLE TO DO?

Established Goals

- **Standard:** The Practice of Science
  Scientific inquiry uses multiple interrelated processes to investigate questions and propose explanations about the natural world.
  Benchmark:
  7.1.1.2.1: Generate and refine a variety of scientific questions and match them with appropriate methods of investigation, such as field studies, controlled experiments, reviews of existing work and development of models.
  7.1.1.2.2: Plan and conduct a controlled experiment to test a hypothesis about a relationship between two variables, ensuring that one variable is systematically manipulated, the other is measured and recorded, and any other variables are kept the same (controlled).
  For example: The effect of various factors on the production of carbon dioxide by plants.
  7.1.1.2.3: Generate a scientific conclusion from an investigation, clearly distinguishing between results (evidence) and conclusions (explanation).

- **Standard:** Interactions Among Science, Technology, Engineering, Mathematics and Society
  Current and emerging technologies have enabled humans to develop and use models to understand and communicate how natural and designed systems work and interact.
  Benchmark:
  7.1.3.4.2: Determine and use appropriate safety procedures, tools, measurements, graphs and mathematical analyses to describe and investigate natural and designed systems in a life science context.

- **Standard:** The Practice of Science
  Science is a way of knowing about the natural world that is characterized by empirical criteria, logical argument and skeptical review.
  Benchmark:
  7.1.1.1.1: Understanding that prior expectations create bias when conducting scientific investigations.
  For example: Students continue to think that air is not matter, even though they have evidence from investigations.
  7.1.1.1.2: Understand that when similar investigations give different results, the challenge is to judge whether the differences are significant, and if further studies are required.
  For example: Use mean and range to analyze the reliability of experimental results.

- **Standard:** Interactions Among Science, Technology, Engineering, Mathematics and Society
  Men and women throughout the history of all cultures, including Minnesota American Indian tribes and communities, have been involved in engineering design and scientific inquiry.
  Benchmark:
  8.1.3.2.1: Describe examples of important contributions to the advancement of science, engineering and technology made by individuals representing different groups and cultures at different times in history.

- **Standard:** Science and engineering operate in the context of society and both influence and are influenced by this context
  Benchmark:
  8.1.3.3.2: Understand that scientific knowledge is always changing as new technologies and information enhance observations and analysis of data. *For example:* analyze how new telescopes have proved new information about the universe.
  8.1.3.3.3: Provide examples of how advances in technology have impacted the ways in which people live, work, and interact.

Transfer

Students will be able to independently use their learning to: (product, high order reasoning)

- Generate/share a scientific report. 7.1.1.2.2
- Generate a scientific conclusion from an investigation, clearly distinguishing between results and conclusions. 7.1.1.2.3
- Create a data table and graph to organize results. 7.1.1.1.2

Meaning

Unit Understanding(s):

Students will understand that:

- Scientific knowledge changes as new evidence becomes available. 7.1.1.2.3
- Advances in technology influence scientific knowledge. 8.1.3.3.2, 8.1.3.3.3
- Scientific knowledge is limited by the evidence available. 7.1.1.2.3
- A testable hypothesis is subject to repeated experimentation or investigation. 7.1.1.1.2
- In controlled experiments, only one variable is altered while the other variables are kept constant. 7.1.1.2.2
- Scientific investigations use appropriate tools and units of measurement for length, mass, and volume. 7.1.3.4.2
- The investigational design (model, field study, controlled experiment or reviews of existing work) is determined by the type of question. 7.1.1.2.1

Essential Question(s):

Students will keep considering:

- Why should I believe what scientists say if it can change?
- Why study scientific inquiry?
- How can I use scientific inquiry to solve a problem in my life?

Acquisition

Knowledge - Students will:

- Understand that prior expectations create bias. 7.1.1.1.1
- Understand the differences between qualitative and quantitative data. 7.1.1.1.2
- Know the difference between a graph and data table. 7.1.1.1.2
- Know what an investigable scientific question is. 7.1.1.2.1
- Know the differences between field studies, controlled experiments, reviews of existing work and models. 7.1.1.2.1
- Identify the problem. 7.1.1.2.1
- Examine whether a problem is observable, measurable (investigable) and could be controlled for variables. 7.1.1.2.1
- Identify scientific evidence and personal opinion. 7.1.1.1.1
- Explain the terms results (evidence) and conclusions (explanation). 7.1.1.2.3
- Identify common tools that are used in life science (Celsius thermometer, metric ruler, timer, balance, microscope, hand lens and graduated cylinder). 7.1.3.4.2
- Identify basic safety procedures and guidelines used in life science investigations. 7.1.3.4.2
- Describe examples of important contributions to the advancement of science, engineering, and technology made by individuals representing different groups and cultures at different times in history. 8.1.3.2.1
- Identify advances in technology that have enhanced observations and analysis of data.
- Examples: microscope and cell theory, inventions of more powerful microscopes to see additional details of cells, and the inventions of technologies that allow us to see DNA. 8.1.3.3.2
- Understand that scientific knowledge may change as new technologies become available. 8.1.3.3.2
- List technologies that have impacted how people live, work and interact.
- Examples, but not limited to: computers, ipods/mp3 players, cell phones, facebook, twitter, refrigeration, heating of food, photography, televisions, advanced submarines and scuba gear, airplanes. 8.1.3.3.3

Reasoning - Students will:

- Interpret graphs and data tables for reliability. 7.1.1.1.2
- Evaluate if further experimentation needs to be done. 7.1.1.1.2
- Analyze a scientific question to determine whether it is investigable. 7.1.1.2.1\
- Justify the best method used to investigate the question. 7.1.1.2.1
- Formulate a question. 7.1.1.2.1
- Formulate a hypothesis. 7.1.1.2.2
- Develop a step-by-step procedure. 7.1.1.2.2
- Analyze experimental design to determine variables. 7.1.1.2.2
- Analyze the difference between evidence and explanations. 7.1.1.2.3
- Distinguish which tools and safety procedures are appropriate for each life science investigation. 7.1.3.4.2
- Analyze graphs from a set of data. 7.1.1.1.2
- Analyze the effects of the contributions to the advancement of science. 8.1.3.2.1
- Explain how these technologies have impacted how people live, work, and interact. 8.1.3.3.3

Skills - Students will:

- Measure and record data. 7.1.1.1.2
- Perform a controlled experiment following a procedure. 7.1.1.2.2
- Use data from graphs and data tables. 7.1.1.1.2
- Measure volume, length, mass, temperature, using the metric system. 7.1.3.4.2
- Accurately use basic measurement tools. 7.1.3.4.2

Common Misunderstandings	**Essential new vocabulary**
● The English system is easier to use than the metric system. ● Science is only done in a laboratory. ● The job of a scientist is to find support for his or her hypotheses. ● There is a single Scientific Method that all scientists follow. ● Investigations that don't reach a firm conclusion are useless. ● The variables that students are most familiar with are the only ones that they need to control. ● Utilizing technology is a recent development in human history. ● Men can think and do science better than women can. ● Primitive cultures are characterized by primitive thinking. ● Scientific inquiry is a recent development in human scientific endeavors. ● Because there are things scientists can't answer right now it negates whatever they do know. ● There was no technology prior to recent years. ● Evidence accumulated carefully will result in sure knowledge. ● Science and technology are identical. ● Science is a solitary pursuit.	● Qualitative Observation ● Quantitative Observation ● Length ● Volume ● Mass ● Data Table ● Temperature ● Controlled Experiment ● Controlled/Constants ● Hypothesis ● Variables ● Mean ● Median ● Range ● Sample Size ● Bias ● Model ● Field Study ● Review of existing work