Anoka-Hennepin Secondary Curriculum Unit Plan

Department:	Science and Technology Education	Course:	PLTW Gateway to Technology (DSF)	Unit 6 Title:	Science of Technology Applied Chemistry	Grade Level(s):	7-8
Assessed Trimester:	Trimester 2	Pacing:	6 Days	Date Created:	6/16/2014	Last Revision Date:	

Course Understandings: *Students will understand that:*

- In the United States, we use both standard and metric systems of measurement
- Three-dimensional computer modeling uses descriptive geometry, geometric relationships and dimensioning to communicate an idea or solution to a technological problem
- Engineers use a design process to create solutions to existing problems
- Different chemical properties affect invention and innovation in going from concept to production.
- Nanotechnology is an emerging field with many new applications.
- Physics control our world and set constraints for motion and mechanism.
- Various forces affect flight.
- There is a relationship between airfoils and bernoulli's principle.

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

Established Goals

Science

Matter and Its Interactions

- **MS-PS1-6** Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.* (MS.PS1.6)

Earth and Human Activity

- **Standard: 6.1.2.1:** Engineers create, develop and manufacture machines, structures, processes and systems that impact society and may make humans more productive.
  Benchmark:
  6.1.2.1.1: Impact of Engineered Systems Identify a common engineered system and evaluate its impact on the daily life of humans. *For example:* Refrigeration, cell phone or automobile.
- **Standard: 8.1.3.3**: Science and engineering operate in the context of society and both influence and are influenced by this context.
  Benchmark:
  8.1.3.3.1: Role of Societal Expectations explain how scientific laws and engineering principles, as well as economic, political, social, and ethical expectations, must be taken into account in designing engineering solutions or conducting scientific investigations.
- **Standard: 9.1.3.3:** Science and engineering operate in the context of society and both influence and are influenced by this context.
  Benchmark:
  9.1.3.3.1: Role of Values and Constraints Describe how values and constraints affect science and engineering. *For example*: Economic, environmental, social, political, ethical, health, safety and sustainability issues.

Engineering Design

Standard: 6.1.2.1: Engineers create, develop and manufacture machines, structures, processes and systems that impact society and may make humans more productive.
Benchmark:
6.1.2.1.2: Risks in Technologies- Recognize that there is no perfect design and that new technologies have consequences that may increase some risks and decrease others.
6.1.2.1.3: Trade-offs in Technologies- Describe the trade-offs in using manufactured products in terms of features, performance, durability and cost.
6.1.2.1.4: Learning from Failures- Explain the importance of learning from past failures, in order to inform future designs of similar products or systems.

Transfer

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

- Students will apply knowledge of chemicals to design and develop a finished product in a given timeline.

Meaning

Unit Understanding(s):	Essential Question(s):
Students will understand that: ● Chemical engineering is concerned with design, construction and operation of machines that perform chemical reactions, separations or mixes, and fluid flow to solve problems and make useful products. ● Chemical engineers apply the knowledge and discoveries of a chemist to solve real life problems. ● Chemical engineers work in many industries including manufacturing, pharmaceuticals, healthcare, environmental, materials, and alternative energy. ● Chemical engineers often work on teams with other engineers, scientists, and technologists.	**Students will keep considering:** ● What does a chemical engineer do? ● What is the difference between a chemical engineer and a chemist? ● Where would a chemical engineer work?

Acquisition

Knowledge - Students will:	Skills - Students will:
● Describe the difference between a chemist and a chemical engineer. ● Describe how salt affects the melting point of ice. ● Describe how an adhesive bond holds two items together. **Reasoning - Students will:** ● Create several solutions to real-life problems by applying knowledge of chemical engineering.	● Utilize the steps of the design process to create product. ● Apply science and engineering skills to make ice cream.

Common Misunderstandings	Essential Vocabulary
● Students, and consumers in general, often assess a product's effectiveness by price and effectiveness alone, without examining hidden trade-offs in terms of the environment, human rights, and economy ● Students believe that design is coming up with good ideas. And that's it. They forget about the rest of it - how to *realize* these ideas and *evaluate* them. ● Students forget the constraints of the environment in which the design will reside. They "arrogantly" ignore the constraints of the user. ● Students tend to focus on the first solution that comes to mind. They stop considering alternatives. ● Students focus only on the very high level (function) or the very low level (structure), without moving between them in a formal manner and considering the giant gulf between the two levels. ● Students belief that design is a serial/linear process, ignoring iterative cycles, revisiting past decisions, and evaluating alternatives." ● Students believe that if he or she cannot see “it,” “it” must not exist.	● Adhesive ● Atom ● Chemical Change ● Chemical Engineering ● Chemical Properties ● Chemical Reaction ● Chemistry ● Compound ● Element ● Mixture ● Molecule ● NaCl ● Periodic Table ● Physical Change