# Anoka-Hennepin Secondary Curriculum Unit Plan

| Department: | Science and Technology Education | Course: | PLTW Gateway to Technology (DSF) | Unit 11 Title: | Flight and Space Traveling and Living in Space | Grade Level(s): | 7-8 |
|---|---|---|---|---|---|---|---|
| Assessed Trimester: | Trimester 3 | Pacing: | 6 Days | Date Created: | 6/16/2014 | Last Revision Date: | |

**Course Understandings**: *Students will understand that:*
- living in space requires a different approach to basic living on earth.

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

### Established Goals

**Science**

Earth's Place in the Universe

- **Standard: 8.3.3.1**: The Earth is the third planet from the sun in a system that includes the moon, the sun, seven other planets and their moons, and smaller objects.
  **Benchmark:**
  **8.3.3.1.2:** Gravity & Orbits Describe how gravity and inertia keep most objects in the solar system in regular and predictable motion.
  **8.3.3.1.5:** Earth's Motions Use the predictable motions of the Earth around its own axis and around the sun, and of the moon around the Earth, to explain day length, the phases of the moon, and eclipses.

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:**
  **6.1.2.1.3:** 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.
- **Standard: 9.1.3.4:** Science, technology, engineering and mathematics rely on each other to enhance knowledge and understanding.
  **Benchmark:**
  **9.1.3.4.4:** Reliability of Data- Relate the reliability of data to consistency of results, identify sources of error, and suggest ways to improve data collection and analysis. *For example*: Use statistical analysis or error analysis to make judgments about the validity of results.
  **9.1.3.4.6:** Analysis of Models - Analyze the strengths and limitations of physical, conceptual, mathematical and computer models used by scientists and engineers.
- **Standard: 9.1.2.2:** Engineering design is an analytical and creative process of devising a solution to meet a need or solve a specific problem
  **Benchmark:**
  **9.1.2.2.2:** Using Models in Designing - 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.
- **Standard: 9.1.3.4:** Science, technology, engineering and mathematics rely on each other to enhance knowledge and understanding.

**Math**

The Number System

- Compute fluently with multi-digit numbers and find common factors and multiples.
  3. Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation. (6.NS.B.3) [OPTIONAL]

Expressions and Equations

- Solve real-life and mathematical problems using numerical and algebraic expressions and equations.
  3. Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation. (7.EE.B.3) [OPTIONAL]

**Literacy in Science and Technical Subjects: Reading and Writing**

**Reading**

Key Ideas and Details

**6.13.4.4:** Determine the meaning of symbols, equations, graphical representations, tabular representations, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.

Comprehension and Collaboration

**6.13.7.7:** Compare and integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, table, map)

**Technological Literacy**

- **Standard:** Students will develop an understanding of the core concepts of technology.
  **Benchmark:**
  N. Systems thinking involves considering how every part relates to others. (2.6-8.N)
  P. Technological systems can be connected to one another. (2.6-8.P)
  Q. Malfunctions of any part of a system may affect the function and quality of the system. (2.6-8.Q)
  R. Requirements are the parameters placed on the development of a product or system. (2.6-8.R)
  V. Controls are mechanisms or particular steps that people perform using information about the system that causes systems to change. (2.6-8.V)
- **Standard:** Students will develop an understanding of the cultural, social, economic, and political effects of technology.
  **Benchmark:**
  D. The use of technology affects humans in various ways, including their safety, comfort, choices, and attitudes about technology's development and use. (4.6-8.D)
  E. Technology, by itself, is neither good nor bad, but decisions about the use of products and systems can result in desirable or undesirable consequences. (4.6-8.E)
  G. Economic, political, and cultural issues are influenced by the development and use of technology. (4.6-8.G)
- **Standard:** Students will develop an understanding of the role of society in the development and use of technology.
  **Benchmark:**
  E. The use of inventions and innovations has led to changes in society and the creation of new needs and wants. (6.6-8.E)
  F. Social and cultural priorities and values are reflected in technological devices. (6.6-8.F)
- **Standard:** Students will develop an understanding of the influence of technology on history.
  **Benchmark:**
  C. Many inventions and innovations have evolved using slow and methodical processes of tests and refinements. (7.6-8-C)
  D. The specialization of function has been at the heart of many technological improvements. (7.6-8-D)
- **Standard:** Students will develop an understanding of the attributes of design.
  **Benchmark:**
  E. Design is a creative planning process that leads to useful products and systems. (8.6-8.E)
  F. There is no perfect design. (8.6-8.F)
  G. Requirements for design are made up of criteria and constraints. (8.6-8.G)
- **Standard:** Students will develop the abilities to use and maintain technological products and systems.
  **Benchmark:**
  H. Use information provided in manuals, protocols, or by experienced people to see and understand how things work. (12.6-8.H)
  J. Use computers and calculators in various applications. (12.6-8.J)
- **Standard:** Students will develop the abilities to assess the impact of products and systems.
  **Benchmark:**
  F. Design and use instruments to gather data. (13.6-8.F)
  I. Interpret and evaluate the accuracy of the information obtained and determine if it is useful. (13.6-8.I)
- **Standard:** Students will develop an understanding of and be able to select and use transportation technologies.
  **Benchmark:**
  G. Transportation vehicles are made up of subsystems, such as structural propulsion, suspension, guidance, control, and support, that must function together for a system to work effectively. (18.6-8.G)
  H. Governmental regulations often influence the design and operation of transportation systems. (18.6-8.H)

## Transfer

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

- Discuss the history and development of rocketry, space flight, and living in space.
- Know that a rocket must overcome the forces of gravity and drag in order to escape the atmosphere.
- Explain the basic principles of flight and rocketry.
- Investigate how changes in various design characteristics of a rocket will affect the rocket's performance.
- List challenges that engineers face to provide safe travel and optimum living conditions in space.
- Explain how gravity relates to an object's orbit.
- Use a simulation to select optimal components for a lunar robot to save stranded astronauts on the moon.

## Meaning

| Unit Understanding(s): | Essential Question(s): |
|---|---|
| **Students will understand that:**<br>● Reliable, inexpensive rockets are the key to enabling humans to travel, work, visit, and commercially develop space.<br>● There are many reasons for going into space, including colonization, intelligence surveillance, international diplomacy, natural resources, research, satellites, and advancing technology.<br>● Humans must adjust their diets, hygiene, clothing, recreation, and sleep patterns in order to survive in space.<br>● Engineers use technology on the moon to research, design, and build appropriate equipment to solve problems related to the topography and atmosphere found on the moon. | **Students will keep considering:**<br>● How does a rocket travel from Earth to the moon?<br>● What is the purpose of the International Space Station?<br>● How is living in space different from living on Earth?<br>● What do humans need in order to live in space? How do they breathe? What will they eat? How will they produce power? How will they shower and use the bathroom?<br>● What are some technologies developed by engineers that help astronauts live comfortably in space?<br>● What are some benefits of using a robotic rover on the moon?<br>● How do the research and experiments conducted in space benefit life on Earth? |

## Acquisition

| Knowledge - Students will: | Skills - Students will: |
|---|---|
| ● Be able to Discuss the history and development of rocketry, space flight, and living in space.<br>**Reasoning - Students will:**<br>● organize information<br>● evaluate resources for living in space(comfort vs. necessity | ● Be able to explain the basic principles of flight and rocketry.<br>● Interpret graphs within RocketModeler. |

| Common Misunderstandings | Essential new vocabulary |
|---|---|
| ● The earth is the center of the solar system. (The planets, sun and moon revolve around the earth.)<br>● Gravity is selective; it acts differently or not at all on some matter.<br>● Force is a property of an object. An object has force and when it runs out of force it stops moving. | ● rocket<br>● space<br>● vector<br>● zero gravity<br>● center of gravity<br>● orbit |