Madison Public Schools

Marine Science and Technology - Unit 2 - Independent Project: Fall Trimester

Unit Focus

The purpose of the Marine Science and Technology Independent Project is to explore marine-related issues through an approved project of their own design. This will help students become more independent, develop perseverance, and become better critical and creative thinkers to help them plan their futures. The entire course examines the chemical, biological and geological properties of the sound as well as marine-related careers from boat building to aquaculture. Boat construction, fishing rod building, maintenance of organisms, physical, chemical, and ecosystem studies related to oceanography are part of this “hands-on” course. Select field trips support the curriculum and provide experiences that students can apply to their individual projects as well as provide practical school to career experience.

Stage 1: Desired Results - Key Understandings

Standard(s)

ITEEA - Standards for Technological Literacy
Technological Literacy: K-12

- Students will develop an understanding of the attributes of design. *8*
- Students will develop an understanding of engineering design. *9*
- Students will develop the abilities to apply the design process. *11*

Next Generation Science Standards (DCI)
Science: 11

- When evaluating solutions it is important to take into account a range of constraints including cost, safety, reliability and aesthetics and to consider social, cultural and environmental impacts. *ETS1.9.B1*

NGSS/NSTA Science & Engineering Practices
NGSS Science & Engineering Practices: 9-12

- Ask questions that can be investigated within the scope of the school laboratory, research facilities, or field (e.g., outdoor environment) with available resources and, when appropriate,

Transfer

T1 Develop a product/solution that adheres to key parameters (e.g., cost, timeline, restrictions, available resources and audience).
T2 Use the scientific process to generate evidence that addresses the original questions.
T3 Leverage connection(s) in other subject areas (including STEM) to make sense of a given problem, product, or solution.
T4 Create models to explore complex systems, show mastery of key science concepts, and/or develop solutions through creation of a product open to testing and redesign.

Meaning

Understanding(s)	Essential Question(s)
U1 When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. **U2** Complicated problems may need to be broken down into simpler components in order to develop and test solutions. **U3** Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering.	**Q1** How can I make a positive contribution to my community? **Q2** What are the criteria and constraints of a successful independent project?

Stage 1: Desired Results - Key Understandings		
frame a hypothesis based on a model or theory. *SE.9-12.1.6* • Define a design problem that involves the development of a process or system with interacting components and criteria and constraints that may include social, technical and/or environmental considerations. *SE.9-12.1.8* • Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. *SE.9-12.3.2* • Plan and conduct an investigation or test a design solution in a safe and ethical manner including considerations of environmental, social, and personal impacts. *SE.9-12.3.3* • Select appropriate tools to collect, record, analyze, and evaluate data. *SE.9-12.3.4* • Decide if qualitative or quantitative data are best to determine whether a proposed object or tool meets criteria for success. *SE.9-12.5.1* **Student Growth and Development 21st Century Capacities Matrix** *Critical Thinking* • Problem Identification: Students will be able to clarify the problem and pose significant questions for investigation. *MM.1.1* *Global Thinking* • Engaging in Global Issues: Students will be able to analyze complex issues and their implications and/or consequences. *MM.5.1*	**Acquisition of Knowledge and Skill**	
	Knowledge	**Skill(s)**
	K1 Technology is any modification of the natural world made to fulfill human needs or desires **K2** Engineering is a systematic and often iterative approach to designing objects, processes, and systems to meet human needs and wants **K3** An application of science is any use of scientific knowledge for a specific purpose, whether to do more science; to design a product, process, or medical treatment; to develop a new technology; or to predict or mitigate the impacts of human actions. **K4** The fields of science and engineering are mutually supportive. **K5** The engineering design process begins with the identification of a problem to solve and the specification of clear goals, or criteria, that the final product or system must meet.	**S1** Identifying problems to be explored through scientific inquiry and engineering practices. **S2** Developing a timeline to address the constraints of doing a long term project. **S3** Develop an engineering solution to address a problem