Marine Science Afloat-Ecology Field Trip Curriculum & NGSS Alignment

Grade 3:

The Marine Science Afloat Field Trip for 3rd grade covers the disciplinary core ideas of these Next Generation Science Standards; 3-LS1-1, 3-LS2-1, 3-LS4-2, 3-LS4-3, 3-ESS2-1, 3-ESS2-2. By utilizing the following prompts in post trip activities the science & engineering practices, core ideas and crosscutting concepts of each of these standards will be fulfilled.

3-LS1-1: From Molecules to Organisms: Structures & Processes

Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.

Science & Engineering Practices	**Disciplinary Core Idea**	**Crosscutting Concept**
Develop models to describe phenomena	Reproduction is essential to the continued existence of every kind of organism. Plants & animals have unique and diverse life cycles.	Patterns of change can be used to make predictions
3rd Grade Prompt #1	Introduction to Puget Sound Food Chains Video microscope Microscope Lab Sea Life Tables	Fulfilled by doing both field trip & post trip activity/prompt

3-LS2-1: Ecosystems: Interactions, Energy & Dynamics

Construct an argument that some animals form groups that help members survive.

Science & Engineering Practices	**Disciplinary Core Idea**	**Crosscutting Concept**
Construct an argument with evidence, data and/or a model.	Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size.	Cause & effect relationships are routinely identified & used to explain change.
3rd Grade Prompt #1	Food Chains Live Dive Sea Life Tables Protecting Puget Sound	Fulfilled by doing both field trip & post trip activity/prompt

3-LS4-2: Biological Evolution: Unity & Diversity

Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.

Science & Engineering Practices	Disciplinary Core Idea	Crosscutting Concept
Use Evidence to construct an explanation.	Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates and reproducing.	Cause & effect relationships are routinely identified and used to explain change.
3rd Grade Prompt #1	Food Chains Sea Life Tables	Fulfilled by doing both field trip & post trip activity/prompt

3-LS4-3: Biological Evolution: Unity & Diversity

Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

Science & Engineering Practices	Disciplinary Core Idea	Crosscutting Concept
Construct an argument with evidence.	For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.	Cause & effect relationships are routinely identified and used to explain change.
3rd Grade Prompt #1	Introduction to Puget Sound Sea Life Tables Food Chains Water Sampling	Fulfilled by doing both field trip & post trip activity/prompt

3-ESS2-1: Earth's Systems

Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.

Science & Engineering Practices	Disciplinary Core Idea	Crosscutting Concept
Represent data in tables and various graphical displays to reveal patterns that indicate relationships.	Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next.	Patterns of change can be used to make predictions.
3rd Grade Prompt #2	Water Sampling	Fulfilled by doing both field trip & post trip activity/prompt

3-ESS2-2: Earth's Systems

Obtain and combine information to describe climates in different regions of the world.

Science & Engineering Practices	**Disciplinary Core Idea**	**Crosscutting Concept**
Obtain and combine information from books and other reliable media to explain phenomena.	Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over year.	Patterns of change can be used to make predictions.
3rd Grade Prompt # 2	Water Sampling Plankton Sampling (turbidity, etc)	Fulfilled by doing both field trip & post trip activity/prompt

Grade 4:

The Marine Science Afloat Field Trip for 4rd grade covers the disciplinary core ideas of these Next Generation Science Standards; 4-LS1-1, 4-LS1-2, 4-ESS3-1. By utilizing the following prompts in post trip activities the science & engineering practices, core ideas and crosscutting concepts of each of these standards will be fulfilled.

4-LS1-1: From Molecules to Organisms: Structures & Processes

Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

Science & Engineering Practices	**Disciplinary Core Idea**	**Crosscutting Concept**
Construct an argument with evidence, data, and/or a model.	Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.	A system can be described in terms of its components and their interactions.
4th Grade Prompt #1	Introduction to Puget Sound Video Microscope Food Chains Live Dive Sea Life Tables	Fulfilled by doing both field trip & post trip activity/prompt

4-LS1-2: From Molecules to Organisms: Structures & Processes

Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.

Science & Engineering Practices	Disciplinary Core Idea	Crosscutting Concept
Use a model to test interactions concerning the functioning of a natural system.	Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions.	A system can be described in terms of its components and their interactions.
4th Grade Prompt #1	Video Microscope Food Chains Live Dive Sea Life Tables	Fulfilled by doing both field trip & post trip activity/prompt

4-ESS3-1: Earth & Human Activity

Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

Science & Engineering Practices	Disciplinary Core Idea	Crosscutting Concept
Obtain and combine information from books and other reliable media to explain phenomena	Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not.	Cause & effect relationships are routinely identified and used to explain change.
4th Grade Prompt #2	Introduction to Puget Sound Water Sampling Protecting Puget Sound	Fulfilled by doing both field trip & post trip activity/prompt

Grade 5:

The Marine Science Afloat Field Trip for 5rd grade covers the disciplinary core ideas of these Next Generation Science Standards; 5-PS3-1, 5-LS1-1, 5-LS2-1, 5-ESS3-1. By utilizing the following prompts in post trip activities the science & engineering practices, core ideas and crosscutting concepts of each of these standards will be fulfilled.

5-PS3-1: Energy

Use models to describe that energy in animals' food (used for body repair, growth, and motion and to maintain body warmth) was once energy from the sun.

Science & Engineering Practices	Disciplinary Core Idea	Crosscutting Concept
Use models to describe phenomena.	The energy released from food was once energy from the sun that was captured by plants in the process that forms plant matter. Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion	Energy can be transferred in various ways and between objects.
5th Grade Prompt #1	Introduction to Puget Sound Food Chains	Fulfilled by doing both field trip & post trip activity/prompt

5-LS1-1: From Molecules to Organisms: Structures & Processes

Support an argument that plants get the materials they need for growth chiefly from air and water.

Science & Engineering Practices	Disciplinary Core Idea	Crosscutting Concept
Support an argument with evidence, data, or a model.	Plants acquire their material for growth chiefly from air and water	Matter is transported into, out of, and within systems.
5th Grade Prompt #1	Introduction to Puget Sound Food Chains Sea Life Tables	Fulfilled by doing both field trip & post trip activity/prompt

5-LS2-1: Ecosystems: Interactions, Energy & Dynamics

Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

Science & Engineering Practices	Disciplinary Core Idea	Crosscutting Concept

Develop a model to describe phenomena.	The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria break down dead organisms and therefore operate as "decomposers." Decomposition eventually restores some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. Matter cycles between the air and soil and among plants, animals and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter back into the environment.	A system can be described in terms of its components and their interactions.
5th Grade Prompt #1	Introduction to Puget Sound Food Chains	Fulfilled by doing both field trip & post trip activity/prompt

5-ESS3-1: Earth & Human Activity

Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Science & Engineering Practices	**Disciplinary Core Idea**	**Crosscutting Concept**
Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.	Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments.	A system can be described in terms of its components and their interactions. Science findings are limited to questions that can be answered with empirical evidence.
5th Grade Prompt #2	Introduction to Puget Sound Protecting Puget Sound	Fulfilled by doing both field trip & post trip activity/prompt

Marine Science Afloat-Water Quality Field Trip Curriculum & NGSS Alignment

Middle School (Grade 6-8):

The Marine Science Afloat Field Trip for Middle School (6-8) covers the disciplinary core ideas of these Next Generation Science Standards ; MS-LS1-5, MS-LS1-6, MS-LS1-8, MS-LS2-1, MS-LS2-3, MS-LS2-4, MS-LS4-3, MS-ESS3-3, MS-ESS3-4, MS-ESS3-5. By utilizing the following prompts in post trip activities the science & engineering practices, core ideas and crosscutting concepts of each of these standards will be fulfilled.

MS-LS1-5:

Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

Science & Engineering Practices	Disciplinary Core Idea	Crosscutting Concept
Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.	Genetic factors as well as local conditions affect the growth of the adult plant	Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability
Middle School Prompt #1	Plankton Sampling Video Microscope Live Dive Sea Life Tables	Fulfilled by doing both field trip & post trip activity/prompt

MS-LS1-6:

Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.

Science & Engineering Practices	Disciplinary Core Idea	Crosscutting Concept
Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.	Plants, algae (phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use.	Within a natural system the transfer of energy drives the motion and/or cycling of matter.

Science knowledge is based upon logical connections between evidence and explanations	The chemical reaction by which plants produce complex food molecules requires an energy input to occur (ie sunlight). In this reaction carbon dioxide and water combine to form carbon-based organic molecules and release oxygen.	
Middle School Prompt #1	Introduction to Puget Sound Plankton Sampling	Fulfilled by doing both field trip & post trip activity/prompt

MS-LS1-8:

Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories

Science & Engineering Practices	**Disciplinary Core Idea**	**Crosscutting Concept**
Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence.	Each sense receptor responds to different inputs electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories.	Cause & effect relationships may be used to predict phenomena in natural systems.
Middle School Prompt #2	Live Dive Sea Life Tables	Fulfilled by doing both field trip & post trip activity/prompt

MS-LS2-1:

Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

Science & Engineering Practices	**Disciplinary Core Idea**	**Crosscutting Concept**
Analyze and interpret data to provide evidence for phenomena	Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction.	Cause & effect relationship may be used to predict phenomena in natural or designed systems.

	Growth of organisms and population increases are limited by access to resources.	
Middle School Prompt #1	Introduction to Puget Sound Plankton Sampling Live Dive Sea Life Tables Protecting Puget Sound	Fulfilled by doing both field trip & post trip activity/prompt

MS-LS2-3:

Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem

Science & Engineering Practices	Disciplinary Core Idea	Crosscutting Concept
Develop a model to describe phenomena	Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem.	The transfer of energy can be tracked as energy flows through a natural system. Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement & observation.
Middle School Prompt #3	Introduction to Puget Sound Plankton Sampling Water Quality #1 & #2 Live Dive	Fulfilled by doing both field trip & post trip activity/prompt

MS-LS2-4:

Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

Science & Engineering Practices	Disciplinary Core Idea	Crosscutting Concept
Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem	Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component can lead to shifts in all its populations.	Small changes in one part of a system might cause large changes in another part.

Middle School Prompt #1	Introduction to Puget Sound Water Quality #1 & #2 Live Dive Protecting Puget Sound	Fulfilled by doing both field trip & post trip activity/prompt

MS-LS4-3:

Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.

Science & Engineering Practices	**Disciplinary Core Idea**	**Crosscutting Concept**
Analyze displays of data to identify linear and nonlinear relationships	Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy	Graphs, charts, and images can be used to identify patterns in data.
Video Microscope Microscope Lab	Video Microscope Microscope Lab	Video Microscope Microscope Lab

MS-ESS3-3:

Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment

Science & Engineering Practices	**Disciplinary Core Idea**	**Crosscutting Concept**
Apply scientific principles to design an object, tool, process or system	Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (neg and pos) for different living things. Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.	Relationships can be classified as causal or correlational and correlation does not necessarily imply causation. The uses of technologies and any limitations on their use are driven by individual or societal needs, desires and values; by the finding of scientific research; and by difference in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time.
Middle School Prompt #4	Water Quality #1 & #2 Protecting Puget Sound	Fulfilled by doing both field trip & post trip activity/prompt

MS-ESS3-4:

Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

Science & Engineering Practices	Disciplinary Core Idea	Crosscutting Concept
Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.	Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.	Cause & effect relationship may be used to predict phenomena in natural or designed systems. All human activity draws on natural resources and has both short and long-term consequences (pos and neg) for the health of people and the natural environment Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes.
Middle School Prompt #4	Water Quality #1 & #2 Protecting Puget Sound	Fulfilled by doing both field trip & post trip activity/prompt

MS-ESS3-5:

Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

Science & Engineering Practices	Disciplinary Core Idea	Crosscutting Concept
Ask questions to identify and clarify evidence of an argument	Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge such as understanding of human behavior and on applying that knowledge wisely in decisions and activities	Stability might be disturbed either by sudden events or gradual changes that accumulate over time.

Middle School Prompt #4	Water Quality #1 & #2 Protecting Puget Sound	Fulfilled by doing both field trip & post trip activity/prompt

High School (Grade 9-12)

HS-LS1-5:

Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy

Science & Engineering Practices	Disciplinary Core Idea	Crosscutting Concept
Use a model based on evidence to illustrate the relationships between systems or between components of a system.	The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen.	Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of and within that system
Introduction to Puget Sound	Introduction to Puget Sound	Introduction to Puget Sound

HS-LS2-6:

Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem

Science & Engineering Practices	Disciplinary Core Idea	Crosscutting Concept
Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments.	A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e. The ecosystems is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability.	Much of science deals with constructing explanations of how things change and how they remain stable.
High School Prompt #1	Water Quality #1 & #2	Fulfilled by doing both field trip & post trip activity/prompt

HS-LS2-7:

Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Science & Engineering Practices	Disciplinary Core Idea	Crosscutting Concept
Design, evaluate, and refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and trade-off considerations.	Moreover, anthropogenic changes in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species. Biodiversity is increased by the formation of new species and decreased by the loss of species. Biodiversity is increased by the formation of new species and decreased by the loss of species. Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. 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.	Much of science deals with constructing explanations of how things change and how they remain stable.
High School Prompt #3	Water Quality #1 & #2 Protecting Puget Sound	Fulfilled by doing both field trip & post trip activity/prompt

HS-LS2-8:

Evaluate evidence for the role of group behavior on individual and species' chances to survive and reproduce.

Science & Engineering Practices	Disciplinary Core Idea	Crosscutting Concept

Evaluate the evidence behind currently accepted explanations to determine the merits of arguments. Scientific argumentation is a mode of logical discourse used to clarify the strength of relationships between ideas and evidence that may result in revision of an explanation.	Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives.	Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.
High School Prompt #4	Live Dive Sea Life Tables Protecting Puget Sound	Fulfilled by doing both field trip & post trip activity/prompt

HS-LS4-5:

Evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

Science & Engineering Practices	**Disciplinary Core Idea**	**Crosscutting Concept**
Evaluate the evidence behind currently accepted explanations or solutions to determine the merits of arguments.	Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline—and sometimes the extinction—of some species. Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or drastic, the opportunity for the species' evolution is lost.	Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.
High School Prompt #1	Water Quality #1 & #2 Protecting Puget Sound	Fulfilled by doing both field trip & post trip activity/prompt

HS-LS4-6:

Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.

Science & Engineering Practices	**Disciplinary Core Idea**	**Crosscutting Concept**

Create or revise a simulation of a phenomenon, designed device, process, or system	Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline—and sometimes the extinction—of some species. Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. 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. *(secondary)* Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs. *(secondary)*	Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.
High School Prompt #3	Water Quality #1 & #2 Protecting Puget Sound	Fulfilled by doing both field trip & post trip activity/prompt

HS-ESS2-5:

Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.

Science & Engineering Practices	Disciplinary Core Idea	Crosscutting Concept
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 (number of trials, cost, risk, time) and refine the design accordingly	The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store and release large amounts of energy, transmit sunlight, expand upon freezing, dissolve and transport materials, and lower and viscosities and melting points of rocks.	The functions and properties of natural and designed objects and systems can be inferred from their overall structure, the way their components are shaped and used and the molecular substructures of its various materials.
High School Prompt #2	Introduction to Puget Sound Water Quality #1 & #2 Protecting Puget Sound	Fulfilled by doing both field trip & post trip activity/prompt

HS-ESS3-2:

Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.

Science & Engineering Practices	Disciplinary Core Idea	Crosscutting Concept
Evaluate competing design solutions to a real-world problem based on scientific ideas and principles, empirical evidence, and logical arguments regarding relevant factors (eg economic, societal, environmental, ethical considerations)	All forms of energy production and other resources extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors. 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.	Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks. Analysis of costs and benefits is critical aspect of decisions about technology
High School Prompt #3	Protecting Puget Sound	Fulfilled by doing both field trip & post trip activity/prompt

HS-ETS1-1:

Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

Science & Engineering Practices	Disciplinary Core Idea	Crosscutting Concept
Analyze complex real-world problems by specifying criteria and constraints for successful solutions	Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. 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. These global challenges also may have manifestations in local communities.	New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is critical aspect of decisions about technology.
High School Prompt #5	Protecting Puget Sound	Fulfilled by doing both field trip & post trip activity/prompt

HS-ETS1-2:

Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

Science & Engineering Practices	Disciplinary Core Idea	Crosscutting Concept
Design a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and trade-off considerations.	Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed	[redacted]
High School Prompt #5	Protecting Puget Sound	

HS-ETS1-3:

Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Science & Engineering Practices	Disciplinary Core Idea	Crosscutting Concept
Evaluate a solution to a complex real-world problem, based on scientific knowledge,	When evaluating solutions, it is important to take into account a range of constraints, including cost, safety,	New technologies can have deep impacts on society and the environment, including

student-generated sources of evidence, prioritized criteria, and trade-off considerations.	reliability, and aesthetics and to consider social, cultural and environmental impacts	some that were not anticipated. ANalysis of costs and benefits is a critical aspect of decisions about technology.
High School Prompt #5	Protecting Puget Sound	Fulfilled by doing both field trip & post trip activity/prompt

HS-ETS1-4:

Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Science & Engineering Practices	**Disciplinary Core Idea**	**Crosscutting Concept**
Use mathematical models and/or computer simulations to predict the effects of a design solution on systems and/or the interactions between systems	Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs	Models (physical, mathematical, computer) can be used to simulate systems and interactions--including energy, matter, and information flows--within and between systems at different scales.
High School Prompt #5	Protecting Puget Sound	Fulfilled by doing both field trip & post trip activity/prompt