NATIONAL ASSOCIATION OF
Museum Schools

School:	Normal Park Museum	Author(s):	Erin Woodrow
Lesson Title:	Plankton Power	Grade Level(s):	MS – HS
Standard:	CLE 3210.T/E.2 Differentiate among the elements of the engineering design cycle: design constraints, model building, testing, evaluation, modifying and retesting. CLE 3210.5.2 Analyze the relationship between form and function in living things.	State:	TN
Content Area:	Biology, adaptations	Time Duration:	One to two 60 minute class periods
Learning Target:	Understand the form & function in the organisms, allowing them to succeed in their environment.	Materials:	Large buckets/aquarium with water, Towels, Materials for building models (paper clips, foil, screws, rubber bands, misc. anything you can find that is mostly water proof), Stopwatches, Pictures of plankton, Live plankton if possible
Key Vocabulary:	Plankton, surface area, volume, adaptations, cilia, flagella, spicules, natural selection, photosynthesis	Technology Connection:	
Engage Now: Opening	Ask students what happens when they are in a pool and they spread out their arms and legs (float) versus balling up (sink – cannon ball dive)? What does the design of a racecar look like to increase speed – sleek design to reduce drag. How do they slow down/stop - parachute is released that increases drag. Students make observations of the shapes and behavior of plankton (phytoplankton and zooplankton) after viewing photos of various plankton species. Create a list of the observations and ask them to speculate on the purpose of the plankton's form. How might their responses to the pool and racecar questions relate to plankton form?		
Teach Now: Mini Lesson	Give the students background information on plankton biology. This can be done in a variety of ways that incorporate visual aids. If possible, obtain live plankton for observation (daphnia can be obtained from sources such as		

	Carolina Biological). Have students make speculations on how plankton form affects their movement through the water and why might this be important. Relate this back to their observation of the purpose of the strange shapes of plankton.
Explore Now: Independent Practice	Students are then instructed to design a plankton model. The goal is to create a plankton model that must not float at the surface, but sink very slowly – the slowest sinking plankton 'wins'. Provide students with buckets of water to test the models and various materials for model construction (packing peanuts, toothpicks, pipe cleaners, straws, modeling clay, foil, beads, craft sticks, wire, paperclips, etc. – anything you can find laying around). Students will also need stopwatches to time the sinking. Give the students a set time limit to design, construct, and test the plankton model. The amount of time can be adjusted depending on the needs of the class. At the end of the building period, the teacher should test and time each design – checking to make sure it doesn't float. This works best in a large glass or plastic aquarium. The slowest model wins (the winner could receive a free-homework/pop quiz pass). Another option is to test the plankton models is heats of twos. Prior to testing the final two, have students discuss and vote on which model they predict will win based on their knowledge of plankton form and function.
Closing:	After the students have explored the concept and used their own words to describe the process, describe the reasoning of the relationship between form and function of the plankton. Why do plankton not float, what are the adaptations that enable the plankton to remain in the photic zone. 1. Small size 2. Projections that increase drag

	3. Long, thin, or flattened shape to increase drag 4. Contain small amounts of oil (light than water)

Lesson Plan

Show Me Now: Assessment	Have the students work in pairs to analyze their own design strategy, the design of the slowest sinkers and of the floaters. Why did some work and other's did not? Observe pictures of plankton and discuss what enables the plankton's adaptations to work so well? Students can do exit passes of their observations and turn in on the way out of class.
Differentiation Opportunities:	Instead of building the plankton, students could also draw an imaginary plankton with explanation of features, students could write a story or poem about life as a plankton
Class/Home Extensions:	Students can calculate the rate of sinking and graph the results. The results can then be compared to the similarities in design of the models themselves as well as to actual plankton. Discussion on how the plankton's ability to slowly swim affects the form.
Expedition Opportunities:	Visit to an Aquarium, or some type of aquatic/marine center
Project-Based Learning Opportunities:	Building an anatomically correct model of plankton or the class models made by students themselves are the projects

*Shaded boxes are required