

3<sup>RD</sup> > 5<sup>TH</sup>  
GRADE

# LESSON PLANS

## LESSON #2: PLANKTON GAME CARDS

### LEARNING OUTCOMES

Complete a pre-assessment T/F quiz. (ONLY if intro mural was not done first)

Be introduced to the idea of being a scientist, artist and teacher.

Learn about the work of Ernst Haeckel and watch a short video about his work.

Work in groups under a “Collaboration Contract” to create a set of phytoplankton info cards using a free open source computer software (such as Inkscape, Gimp or GoogleSketch-up, 123Ddesign, 123Dsculptplus, Scuptress) or hand drawn.

Facilitate and play a variety of class-designed games about phytoplankton.

Reflect and assess own group’s game and another groups’ game.

**TIME REQUIRED FOR LESSON: 4 fifty minute periods depending on amount of cards produced & games played.**

### BIG IDEA

Students will gain new understanding, appreciation and emotional connections to phytoplankton by making the invisible visible through a series of lesson plans and interactive puzzle game experiences.

### BACKGROUND

Phytoplankton are an essential organism in our world’s aquatic ecosystems. They are the base of the ocean and freshwater webs of life. They absorb up to half of our worlds CO<sub>2</sub> and create almost half of our worlds fresh oxygen on a daily basis. Human beings have an impact on this otherwise invisible organism through the daily choices that we make, such as polluting our water with plastic and oil and our air with carbon. These organisms have a direct impact on human-ities ability to thrive, by providing us with the air that we breathe and the food that we eat.

You can help us build a more informed FUTURE TOGETHER as Climate Change, Healthy Oceans & Waterways, and Sustainability become some of the most pressing issues of our time. The University of Maine in collaboration with the University of California Santa Cruz have created an innovative Art & Science multimedia exhibit / puzzle to educate and engage our communities across the country. This timely and unique mobile system is called [Oceanic Scales](#).

### ESSENTIAL QUESTIONS

What are phytoplankton?

What do they look like?

Why are they important to us?

## MATERIALS/SOURCES

- T/F quiz - (PDF here)
- Ernest Haeckel video- [https://www.youtube.com/watch?v=tl\\_onFMjJWA](https://www.youtube.com/watch?v=tl_onFMjJWA) (8 minutes),
- Websites for research-<http://oceandatacenter.ucsc.edu/PhytoGallery/phytolist.html>
- <http://planktonchronicles.org/en/>
- [https://www.bigelow.org/files/5814/2142/8483/Tiny\\_Giants\\_Exhibition\\_Handout\\_v5.pdf](https://www.bigelow.org/files/5814/2142/8483/Tiny_Giants_Exhibition_Handout_v5.pdf)
- Collaboration Contract - (PDF here)
- Materials- computers and printers
- If hand drawn- index cards, fine black sharpies (preferably) and/or markers, colored pencils etc.

## ACTIVITIES

### ENGAGE

Allow students to share some phytoplankton facts they learned from the first lesson (or have students take T/F quiz if they did not do lesson #1). Introduce the idea of being a combined scientist, artist and educator and show them the video about Ernest Haeckel. After the video, explain to students that they will use Haeckel as inspiration and work in groups to explore phytoplankton and design a simple game, such as Memory or Dominoes, to answer the three essential questions. Students will be introduced to the Collaboration Contract (attached) and asked to copy the three essential questions onto the contract. Brainstorm as a class a few ideas about how they could design a game about phytoplankton and the essential questions using the preferred open source software of your choice. If needed, give them a short demonstration on how to use the software.

### DISCUSS/EXPLORE

Students will break up into groups and use the Collaboration Contract to guide their discussions and decision-making process before they begin research and game making. Each student should complete a Collaboration Contract and the group should get their plan approved by a teacher before moving on. The Collaboration Contract works as expectations and assessment to the project, which allows teachers to differentiate expectations from group to group depending on needs. Ultimately, students will be reading information and paraphrasing into one or two important facts, as well as making connections through designing/drawing a sketch of each phytoplankton on the card. Amount and variety of cards will depend on game chosen and teacher expectations.

### SHARE/EVALUATE/REFLECT

When groups finish their games, they will switch off to verbally facilitate their game to another group and play a different group's game. Students will evaluate one other game of their choice, reflect on their own group's game and answer essential questions in their own words.

### EXTENSIONS

There are infinite directions to go from here. Students could:

- Write/type directions for game.
- Do additional research to write more comprehensive information on each card.
- Share games with another class or during a family game night.
- 3D print images of phytoplankton.

## CONNECTIONS TO STANDARDS

### 3rd Grade:

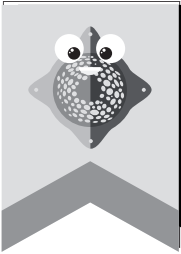
- NGSS.3-LS3-1 Analyze and interpret data to make sense of phenomena using logical reasoning.
- NGSS.3-LS4-4 Knowledge of relevant scientific concepts and research findings is important in engineering.
- CCSS.ELA-LITERACY.RI.3.5 Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently.
- CCSS.ELA-LITERACY.W.3.7 Conduct short research projects that build knowledge about a topic.
- CCSS.ELA-LITERACY.SL.3.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.

### 4th Grade:

- NGSS. 4-PS4-3 Knowledge of relevant scientific concepts and research findings is important in engineering.
- CCSS.ELA-LITERACY.SL.4.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly.
- CCSS.ELA-LITERACY.W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic.
- CCSS.ELA-LITERACY.RI.4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

### 5th Grade:

- NGSS.5-ESS1-1 Natural objects exist from the very small to the immensely large.
- NGSS 5-ESS3-1 A system can be described in terms of its components and their interactions.
- CCSS.ELA-LITERACY.W.5.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic.
- CCSS.ELA-LITERACY.SL.5.5 Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.
- CCSS.ELA-LITERACY.SL.5.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.



## COLLABORATION CONTRACT

NAME \_\_\_\_\_

GROUP MEMBERS \_\_\_\_\_



### ESSENTIAL QUESTIONS:

- 1.
- 2.
- 3.

### TEAM CHALLENGE:

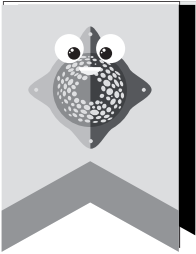
CREATE A GAME ABOUT PHYTOPLANKTON TO TEACH OTHERS ABOUT WHAT THEY LOOK LIKE AND HOW THEY ARE RELATED TO EACH OTHER AND HUMANS.



### TEAM ROLES:

Team Roles- Decide who will have what responsibilities.

- **Team Leader Responsibilities:**  
Keep team on task. Share and Listen to teammates' ideas. Ask questions to teacher. Help with whatever is needed. Introduce game to class first.
- **Art/Design Director Responsibilities:**  
Share and Listen to teammates' game ideas. Make final decision about how game will look. Make visual cards of phytoplankton as needed for game.
- **Researcher Responsibilities:**  
Share and Listen to teammates' game ideas. Use the Internet sites and/or handouts to read phytoplankton facts and write down one or two important facts for game.



## BRAINSTORM & PROPOSAL FOR PHYTOPLANKTON GAME



### TEAM ROLES:

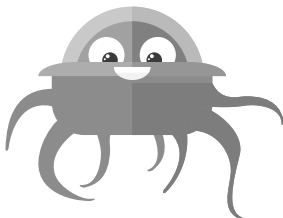
MUST HAVE TEACHER APPROVAL!

- What popular game is your game based from?
- What is the same about your game?
- What will be different about your game?
- How many info cards do you need? All different or pairs?
- What other components or pieces do you need for your game? (Game board? Dice? Etc.)



### PHYTO CHARACTERS:

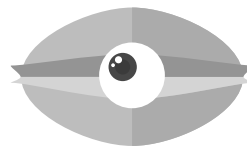
Here are some examples of the characters from the Phyto Heroes Game:



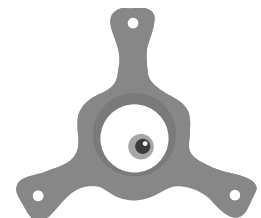
PHYTOPLANKTON TYPE: |  
DINOFLAGELLATE - NOCTILUCA  
HOME: MONTEREY BAY,  
AUSTRALIA, JAPAN, CHINA



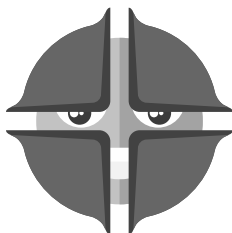
PHYTOPLANKTON TYPE: |  
DINOFLAGELLATE - AMYLAX  
HOME: NORTH ATLANTIC OCEAN  
NORWAY



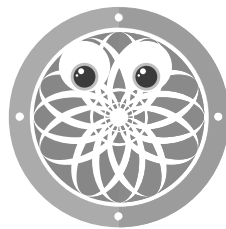
PHYTOPLANKTON TYPE: |  
DIATOM - CYMBELLA  
HOME: FRESHWATER - COLORADO  
CREEKS / RIVERS



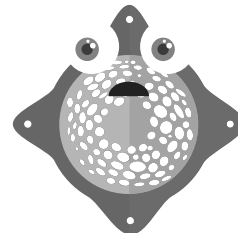
PHYTOPLANKTON TYPE: |  
CHLOROPHYTE - DESMID  
HOME: CALIFORNIA MOUNTAIN  
LAKES



PHYTOPLANKTON TYPE: |  
DINOFLAGELLATE - L. POLYEDRUM-  
HOME: PACIFIC OCEAN  
CALIFORNIA



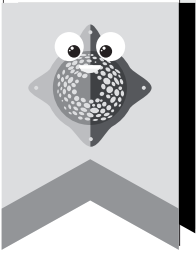
PHYTOPLANKTON TYPE: |  
DIATOM - CYCLOTELLA COMTA  
HOME: GREAT LAKES



PHYTOPLANKTON TYPE: |  
DINOFLAGELLATE - AKASHIWO  
HOME: TROPICAL - FLORIDA  
S. CALIFORNIA / CARRIBEAN



PHYTOPLANKTON TYPE: |  
DINOFLAGELLATE - DINOPHYSIS  
HOME: NORTH ATLANTIC AND  
PACIFIC

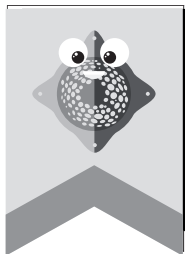


## BRAINSTORM & PROPOSAL FOR PHYTOPLANKTON GAME



### GAME DESIGN:

Sketch and label what the game will look like:



## REFLECTION

NAME \_\_\_\_\_

DATE \_\_\_\_\_

GROUP MEMBERS \_\_\_\_\_



### PLEASE EVALUATE ONE OTHER GROUP'S GAME.

Circle the correct answer:

- Was the game thoroughly explained to you before playing?  
Yes      Kind-of      No
- Does it make sense?  
Yes      Kind-of      No
- Did you learn what phytoplankton look like?  
Yes      Kind-of      No
- Did you learn how phytoplankton are related to each other?  
Yes      Kind-of      No
- Did you learn why phytoplankton are important to people?  
Yes      Kind-of      No
- What was your favorite part of the game?



### PLEASE EVALUATE YOUR OWN GROUP'S GAME.

- What work did you contribute to your group's game?
- What was easy or fun about this project?
- What was hard or frustrating about this project?
- Does your game teach others what phytoplankton look like?  
Yes      Kind-of      No
- Does your game teach others how phytoplankton are related to each other?  
Yes      Kind-of      No
- Does your game teach others why phytoplankton are important to humans?  
Yes      Kind-of      No
- Are you proud of your group's game?
- What would you change to make it better?



PLEASE ANSWER THE QUESTIONS IN YOUR OWN WORDS.

- WHAT ARE PHYTOPLANKTON?

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- WHY ARE PHYTOPLANKTON IMPORTANT TO US?

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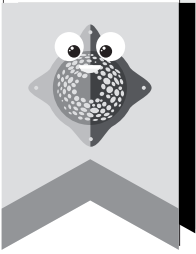
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## TEACHER RUBRIC



### STUDENT EVALUATION

1. Did the student fulfill team role responsibilities?  
1 2 3 4 5
2. Did the student collaborate with group members respectfully?  
1 2 3 4 5
3. Did the student seem knowledgeable about game and participate in explaining how it works?  
1 2 3 4 5
4. Did the student complete contract and reflection thoughtfully and honestly?  
1 2 3 4 5
5. Was the student able to answer the essential questions stated above?  
1 2 3 4 5

Comments:

Score: \_\_\_\_\_ / 25