Algae in our backyard : An ArtScience Exploration

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I **Overview**

This course is an exploration of marine algae (phytoplankton) through several scientific and artistic processes. The content will cover several important topics in ocean biology and ocean change, frequently linking back to more “local” issues in the South China Sea, and several key methodologies in both art and science. Students will be exposed to different scientific data, from microscopy (using local water samples for observations) to satellite (using downloadable maps of the South China Sea), and learn how these data help us understand local issues that affect the ocean. In addition, students will use photography, scientific illustration and data visualization to learn, reflect and communicate the information they have gathered from the microscopes and satellite maps. This will result in a final exhibit combining scientific and artistic processes and findings.

II **Learning Objectives**

(1) Comprehend the link between phytoplankton and human quality of life

(2) Explain the effect of human actions on marine life in the South China Sea

(3) Discover how artistic & scientific processes are similar and ways they overlap

(4) Learn about artists who use water and/or scientific processes in their work

(5) Learn about scientific illustration and ways to incorporate it into the classroom

(6) Analyze and compare different types of data on phytoplankton, fisheries and climate in the South China Sea

(7) Apply art/design related activities to achieve creativity, collaboration and communication in the classroom

III **Assessment**

The success of the module will be assessed by the quality of the final artworks (photographs, illustrations) to demonstrate some of the essential science process skills as outlined in the STEM Hong Kong curriculum guidelines, observing, conducting practicals and communicating; as well as generic skills (2.2.2) of collaboration and creativity:

1. Scientific observations of the water samples through drawing and photographs

2. Handling and using the apparatus (microscope) correctly

3. Use of design principles to create a dynamic composition and compelling visual image

from photographs

4. Clarity in written artist/scientist statement

5. Overall quality of final collaborative exhibition

During the course (daily), time would be allotted for students to reflect on what they have learned in a personal journal, answer short written surveys, and prepare an artist/scientist statement. The formal surveys would serve as a way for instructors to assess how their students are absorbing new knowledge.The journal responses would help students record their impressions of new knowledge, as well as the old knowledge they had about marine life and the ocean before entering the course, which would hopefully help them develop their art projects. The artist/scientist statement would summarize what they have learned cumulatively through the entire course, before and after creation of their art project.

IV **Module Structure (Teaching approach)**

Day one would focus on several themes: the role of algae in the health of our oceans and planet, scientific approaches to observing algae in local bodies of water, and the role of art in the process of understanding water and ocean issues. On this day, the students will be exposed to examples of data collected using microscopes and satellite, and examples of how art informs science and our understanding of the water around us. Students will have the opportunity to photograph/image some of the microscope and satellite-based observations, adapt the images using photo editing software, and print these images out.

Day two will focus on project development, feedback and reflection. The students will come into class with their printed images, and with an idea of how they will illustrate and render the information on these images, and any other miscroscope/satellite-based observations into visual art. After some time drawing, the students will engage in a critique session (sharing of their photos/illustrations) that exemplifies constructive criticism and a safe space for giving feedback in a classroom. By the end of class, the students will also prepare an art/scientist statement reflecting on their scientific observations and artistic processes.

The module will combine lectures, hands-on/interactive demonstrations of scientific and artistic concepts, group work and class discussion of observations and art .

V **Teacher professional development**

Teachers will learn about ways arts education and particularly various artists engage with scientific methodologies along with a hands-on learning experience of using scientific illustration in the classroom as a means to have low-tech options for observation and creativity.

Moreover, the course would provide educators in Hong Kong specific themes in oceanography that they can integrate into future curricula beyond the summer. They would be able to gather several examples of ocean-related issues in the South China Sea that likely affect Hong Kong residents. The interactive lessons and activities of the summer module will further provide instructors with approaches to develop specific skill-sets in their students: data analysis, computer literacy (downloading large data sets and running codes), and problem-solving.

VI **Relevancy of module**

The course module fits into this pK-12 summer program, Into the Water, for several reasons. First, the module integrates broad scientific concepts in oceanography with local water issues that would impact Hong Kong residents. Thus, it encourages ocean science learning through the lens of local issues that are relatable to the students.

Second, this program adds the much needed ‘A’ for the Arts, to a STEM curriculum, supporting a powerful approach to make ocean science education more effective. Art is an important way to interpret the world and create a well-balanced student as cultivate 21st century skills such as creativity, collaboration and communication.

As stated above part of the Hong Kong STEM curriculum calls for co-curricular development and the integration of essential science skills which reflect the 21st Century learning skills. Students not only need to discover and experiment, but they also need to understand how to exhibit and communicate about their discoveries. Hopefully, these creative projects help students consolidate the module concepts, as well as inspire the students to come up with creative responses to the local effects of climate and ocean change in Hong Kong. More broadly, by learning art and design skills they will gain a greater understanding of how to share with others the excitement of science!

We hope that these lessons will be transferable to many types of concepts in earth science, or any science in general, that the teachers may want to teach going forward. This module will provide materials and ideas to teach a variety of concepts that can be applied elsewhere: data analysis, observation-based science, connecting scientific concepts that span several scales, art as a medium for observing and communicating results, intersections between the artistic and scientific process and resources around this - such as information about artists that use scientific processes/ideas in their work.

**Biographical Profiles of Team**:

Kyle Browne is an artist and educator from Boston, MA, whose inspiration is primarily derived from the natural world. She has done extensive work with science teachers to develop and implement STEAM curriculum in the Cambridge Public Schools. Her artistic work can be seen at kylebrowne.com

Sarah is a postdoctoral fellow at University of British Columbia (Ocean Leaders program), studying the phytoplankton communities the Subarctic North Pacific Ocean and their impact on important fisheries in western Canada. Working with the Canadian fisheries department and Vancouver aquarium, she aims to improve yearly predictions of sockeye salmon populations in British Columbia and explore creative ways to share her findings with the public. She is from Queens, NY and got her degree in oceanography at Woods Hole Oceanographic Institution.