Wake: Tales from the Aqualab is a science game that challenges students with engaging and authentic missions in a variety of ocean-based ecosystems. The game is designed to target the NGSS science practices of experimentation, modeling, and argumentation, in the context of middle school life sciences. In this single-player game, students play at their own pace, taking on gradually more complex science challenges in an open-ended environment.

Grade levels: 6-9 Life Sciences
Length: 40 min minimum for one session, up to 10 hours of game-play, plus time for discussion.
Needs: Chromebook, PC or Mac running Chrome with internet access

In the game, students take the role of a scientist studying ocean ecosystems, traveling to different ocean research sites to answer questions and solve problems. As they move throughout the game, students will develop skills in setting up experiments, using models to solve problems, and constructing arguments using evidence.

Learn more about the game and connect with other teachers at
https://sites.google.com/wisc.edu/aqualabteacherguide/home

Basic Use:

Here's the link to start the game: https://fielddaylab.wisc.edu/play/wake/ci/production/

On the first day you might want to demonstrate the basic interface, and explain the structure of the game. Things to note:

- When students click New Game, the game will assign them a Player Code. We recommend writing down the Player Code to remember it, so that in future sessions they can click Continue Game, enter their Player Code, and pick up where they left off.
- The student will play the role of Olivia, or Ollie, or "O" as she likes to be called.
- Ollie pilots a yellow sub to explore underwater, and on the surface, has her own ship as well, which she uses to travel to different sites.
- At each of the four sites (Kelp Forest, Arctic, Coral Reef, and Bayou), there is an underwater research station, at a site marked with a red buoy. Ollie will visit the research station first, meet the scientists there, take on jobs to earn money and experience, and upgrade the sub.

- There are two important tools in the top right corner – the AQOS, a lab notebook where all data is stored, and also information about the current job and tasks – and Vict0r, an AI companion that can provide help.

Prompts after one day of play:

Discussion about science content:

- In the first job, you were asked to figure out the food web between kelp, urchins, and otters. What did you find out?
    - *Otters eat urchins, urchins eat kelp.*
- Discuss this simple food web in more detail.
    - *Suggested vocabulary: predator, prey, consumer, producer.*
- How is energy transferred in this food web? Where does the kelp get its energy?
    - Kelp is a kind of plant, it gets energy from the sun. Urchins get energy from eating the kelp, Otters get energy from eating urchins.

Discussion about science practices:

- In Wake, you play as an ecosystem scientist. What science tasks did you get to do?
    - *Scan organisms.*
    - *Experiment using observation tank (see what eats what).*
    - *Report findings, present evidence from experiments.*
- What experiments did you do? What data did you collect?
- How do you feel that the game compares with what scientists do in real life?

Extended play

Aqualab is designed to be played over several class periods - we recommend playing for one to two weeks, either all at once or coming back periodically. There are over 35 jobs that students can take on, at increasing levels of complexity, and an engaging story that unfolds as they play.

Students will explore many dive sites and fascinating creatures. Some examples of the range of student jobs in the Aqualab include:

- Find out why the staghorn coral at a coral reef are struggling to survive. Could it be related to the influx of sargassum seaweed in the area?
- A whale has gone missing from a pod being tracked by Arctic researchers. When students find the whale's carcass, what can they learn about the wide variety of underwater decomposers?
- How are mussels in the kelp forest affected by warmer temperatures? Is it causing them to reproduce more slowly?

Students will have to engage in a variety science practices in order to investigate and answer these and other questions, using advanced tools for experimentation and modeling:

Experimentation:

- **Observation Tank** to collect information about organism interactions..
- **Stress Tank** to learn about organism tolerance to different levels of temperature, light, and pH.
- **Measurement Tank** to measure rates and processes over time.

Modeling:

- **Visual Modeling** to represent ecosystem interactions.
- **Numerical Modeling** to run simulations of future change and make predictions.
- **Intervention Modeling**, to perform what-if experiments and predict the effect of changes to the ecosystem.

NGSS Science standards:

- MS-LS1-4. Use arguments based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
- MS-LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
- 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.
- MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. (e.g. predation, symbiosis, etc)
  MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem
- MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
  MS-LS4-4. Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.
- MS-LS4-6. Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.
- MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.