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| Slide | Notes |
| 1 | **Introduction**  Welcome! Last time we talked about physics in the ocean—how water moves because of wind, temperature, and salt. Today we’re going to zoom in close to look at small things that live in the ocean. The last time we did experiments, but today we’re going to focus more on observation. Observation is a really important part of being a scientist. By the end of today, you’ll be able to use a microscope to observe small living things in the ocean. |
| 2 | **What do you see?**  Before we zoom in, let’s zoom out – because sometimes really small things can have a big impact. We’re here in [**insert your location, change on map**]; let’s take a look at something that happened down by the coast of South America |
| 3 | **What’s making those colors [poll question]?**  Teacher sets up poll, with following suggested options:   1. Oil spill 2. Seaweed 3. Gatorade 4. Teeny tiny living organisms   Review poll with students. Make sure to give positive affirmation - it’s not about being right or wrong! **Don’t give away the answer yet!** |
| 4 | **A closer look...**  Solicit input from class. What do you think is making the water green? |
| 5 | **What’s growing in this aquarium [poll question]?**  Suggested options:   1. Fish poop 2. Seaweed 3. Tiny little plants 4. Dirt   Review poll with students. Make sure to give positive affirmation - it’s not about being right or wrong! **Don’t give away the answer yet! [Note - the brown color in this aquarium actually is the same type of algae (diatoms) that students will later see in their microscopes]** |
| 6 | **What’s in these bottles?**  Solicit input from the class. **Reveal answer = “Phytoplankton”** |
| 7 | **So what is phytoplankton?**  Let’s break this word down into its parts. “Phyto” means plants, and “Plankton” means something that floats or drifts along in the water. So phytoplankton are little plant-like living things that just like plants, can use energy from the sun in order to grow. But unlike most other plants that grow out of the ground, phytoplankton float along in the water in the ocean or in lakes. |
| 8 | **Types of phytoplankton**  There are a bunch of different types of phytoplankton, and they come in all different shapes and sizes and colors.  Take a look at all the different types of phytoplankton on this slide and **ask students to look for themselves, guided by the following questions**:   * What colors do you see? * What shapes do they make? |
| 9 | **What do animals eat in the ocean [poll question]?**  Where do phytoplankton fit into the food web? Big animals like whales and seals eat smaller animals like fish and crabs, and fish and crabs eat even smaller fish or shrimp or other things. So what do the smallest animals eat?  Poll question: If big animals eat smaller ones in the ocean, what do the smallest animals eat?   1. Seaweed 2. Tiny little plants 3. Sand 4. Seaweed and tiny little plants   [**Answer = 1, 2, 4, all good answers with 4 being the best answer since some sea creatures eat larger marine plants like kelp and seagrass, while others subsist on phytoplankton.**]  Phytoplankton are the smallest things in the ocean, and they use the energy from the sun to grow. They’re eaten by the next-smallest things in the water, like tiny fish and sea snails and shrimp, which are eaten by slightly bigger fish and so on up the food chain all the way to whales and sharks. So everything in the ocean, all the way up to the biggest animals, all depends on phytoplankton.  Even though these things are really small, none of the other things in the ocean could live without them.  Kind of like on land, everything depends on grass and other plants, and bigger animals eat the smaller animals that eat the grass. |
| 10 | **Transition slide, remind them about activity, get kids excited about upcoming seawater scavenger hunt with foldscopes!** |
| 11 | **What is a microscope [poll question]?**  Poll: What does a microscope help you do?   1. See things that are far away 2. Listen to someone's heartbeat 3. See things that are really small 4. Look out from a submarine   Note that all have “scope” (telescope, stethoscope, microscope, periscope). If a lot of students guess telescope, you can say something along the lines of:  “That’s a great guess. Telescopes help us see things really far away in **outer space** and you can think of microscopes as like the opposite, they help us see small things in **inner space**.” |
| 12 | **How small is small, how big is big?**  Help students to use their bodies to imagine how big a whale, turtle, copepod and phytoplankton cell is in comparison to them. You can also have them imagine what we would look like to a copepod / diatom. *Horton Hears a Who!* could be a good metaphor for kids who know this book. |
| 13 | **When were microscopes invented [poll question]?**   1. 1000 B.C. 2. In the late 1600s 3. In the mid-1800s 4. In the early 1900s   [Answer = late 1600s by Antonie van Leeuwenhoek]  When going through the slide animations, you can explain how the *Foldscope* now allows everyone to use a microscope! The image at the top right shows the *Foldscope* inventor Dr. Manu Prakash.  **Fun fact:** The lenses on his first microsopes were spherical, just like the ones on the *Foldscope.* |
| 14 | **Activity time. Refer to instructions on handout. Begin showing kids how to use *Foldscope* (show how to align sample with lens and focus slides)** **and then set them free to play!**  Important safety reminders:   * Be careful of breaking the glass slides (don’t bend or sit on *Foldscope*) * ***DO NOT*** look into direct sunlight |
| 15-16 | **How many did you find? What did you learn?**  Ask for feedback, can run *Mentimeter* poll to get wordcloud if doing over zoom [**teacher will have to recreate]** |
| 17 | **Small things make a big impact!**  To summarize, we learned today about very small plant-like living things called phytoplankton that are so small we can only look at them under a microscope. And even though phytoplankton are really small creatures, they cause a huge impact! Phytoplankton grow using sunlight and support the whole rest of the food chain in the ocean by getting eaten by other, slightly larger animals. And sometimes they can grow to such huge numbers that we can even see them from space! ​ |
| 18 | If phytoplankton grow too much in the water, they can actually make other things like fish and turtles sick. This can happen from pollution from farms or wastewater that contain lots of nutrients that cause the phytoplankton to “bloom”. |
| 19 | Some phytoplankton also make light of their own. Here are some people surfing at night in water where there are light-making phytoplankton growing in the ocean. ​ |
| 20 | **Now you are a microbiologist too!**  Take some time to congratulate students on being a “real scientist” and reinforce the fact that this is what scientists do, and remind them if they liked today they could read more about phytoplankton at their local library or use the foldscope to look at other things for fun! |
| 21 | Explain how you can attach to your smartphone |
| 22 | Ask students on what they want to look at next with their foldscope.  Some good ideas if kids need some encouragement:   * Algal blooms * Tide pools * Pet water bowls * Feathers * Insects * Soil (mixed with water) |