Ocean Leaders Bridge Curriculum

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Overview

During the Ocean Leader Bridge Program, students are immersed in the Ocean Discovery culture and community, and engage in exciting science programming.

Ocean Discovery Goals

Students will BELIEVE that:

- they can recognize science;
- science is important;
- science, in its many forms, has relevance for their lives;
- they can do science;
- challenges can be opportunities to learn and grow, rather than permanent obstacles
- a career in science is a possibility for them; and
- they can make a difference.

Students will ACHIEVE:

- improved understanding of scientific concepts and the scientific process; and
- achievement of positive academic performance.

Students will LEAD:

- taking the necessary steps to pursue and obtain a career in STEM;
- taking opportunities to use science to make a difference; and
- participating as servant leaders and mentors.

Overarching Responsibilities of Team Lead:

- Classroom management & timing of lessons
- Execution of all lesson material in this curriculum
  - Regular – content that should be covered using language of your choice
  - (Parenthesis) – Teaching notes and actions
- Incorporation of science and alumni mentors into programming
- Use attention getters when transitioning from activity-to-activity
- Lead discussions & ask guiding questions to get students thinking about science
- Use Belief and Science Discovery Process language throughout lessons
- Encourage participation from all students to create an inclusive environment
- Determining floor management with team BEFORE the start of all lessons

Ocean Leader Bridge Story

External – Students

I am excited to continue my journey with Ocean Discovery Institute as an Ocean Leader! Over the years, Ocean Discovery has helped me believe that science is something I can do and a science leader is someone I can become.

On our first two days, I meet the Ocean Discovery staff, the scientists, and alumni mentors, and learn about my new Ocean Discovery home - the Living Lab. We participate in an Ocean Leader Challenge, create an avatar of ourselves as scientists, and explore the lab during a scavenger hunt- the Living Lab is a cool place, I could see myself returning here after the Bridge program!

We spend the next three days investigating invertebrates. We learn what invertebrates are, and explore the rocky seashore to see and touch them. I see everything from a squishy sea anemone to a sea star with hundreds of tube feet – cool! We investigate adaptations invertebrates have to help them survive at the rocky seashore and in the canyon and talk with a scientist who does research to help conserve invertebrates. We each come up with our own tweet about why it is important to protect these animals to share with family and friends.

Next, we move on to investigating fish. We focus on two types- bony fish and cartilaginous fish. We learn about these fish by dissecting both a shark and a bony fish- so cool! We take a trip to the Birch Aquarium to explore how fish from different places are adapted to live in the ocean, and then we visit the Living Coast Discovery Center and get to touch living sharks – amazing! We also talk to a science leader about how to help protect sharks and fish and write another conservation tweet to share with family and friends.

Finally, we study marine mammals. We learn about the unbelievable range of shapes and sizes marine mammals come in when we build a life-size mural of marine mammals with chalk – did you know that blue whales are as large as a school bus?! We do a series of experiments to see how different types of marine mammals are adapted to eat and to live in the ocean and on land – so fun! We get to interview another science leader about her work with conserving marine mammals and then learn how to do similar DNA tests that she uses in her research ourselves – I feel like a real scientist!

Throughout the program, I also learn skills that will be helpful in high school and college. I learn how to create concept maps from lecture notes and how to turn these notes into flashcards – a great tool for studying! I also have the opportunity to attend office hours with mentor scientists – I learn this is a great opportunity to ask questions and clarify things I don't understand during the day. It makes me think about how I could take advantage of talking to my teachers after class when I don't understand something next year.

Wow-what an amazing two weeks! I learned so much about science and myself as a future science leader! I can't wait to go back!

Syllabus - External

Date	Community Building (9:00am – 9:45am)	Science Lab (9:45am – 12:15pm)	PEN Reflection Program (1:00pm – 2:00pm)
Day 1	*Community Question:* What are some of your favorite foods that your family makes? *Community Building Activity:* Curiosity Cards	*Meet Your Ocean Discovery Family* Ocean Leader Challenge	Introduction to PEN
Day 2	*Community Question:* What is one thing you are grateful for? *Community Building Activity:* Networking #1: Handshakes	*Meet Your Ocean Discovery Home* Living Lab Tour & Scavenger Hunt	Writing
Day 3	*Community Question:* What is something about you that you think is unique? *Community Building Activity:* N/A	*What are Invertebrates?* Field Trip to the La Jolla Tidepools	Writing
Day 4	*Community Question:* What is something you enjoy doing with your family outdoors or in nature? *Community Building Activity:* Curiosity Cards	*Invertebrate Adaptations* Invertebrate Experiment	Writing
Day 5	*Community Question:* Five years from now how do you think your life will be different? *Community Building Activity:* Would you Rather	*Invertebrate Conservation* Canyon Invertebrates & Invasive Plant Removal	Writing
Day 6	*Community Question:* What is one thing you are excited about and one thing you are nervous about for tomorrow's overnight field trip to Catalina? *Community Building Activity:* Networking #2: Handshakes and Introductions	*What are Fishes?* Dissection of Bony Fish and Sharks	Writing

Day 7	*Community Question:* What is something you enjoy doing with your family outdoors or in nature? *Community Building Activity:* Curiosity Cards	*Fish Adaptations* Field Trip to Birch Aquarium	Writing
Day 8	*Community Question:* What are you most excited about starting high school? Nervous about? *Community Building Activity:* N/A	*Fish Conservation* Field Trip to Living Coast Discovery Center	Final Reflection
Day 9	*Community Question:* What are some life skills you think everyone should learn? *Community Building Activity:* Networking #3: Handshakes and Introductions	*What are Marine Mammals?* Investigate Marine Mammals	Peer Review
Day 10	*Community Question:* What is one way you deal with stress to make yourself feel better? *Community Building Activity:* Curiosity Cards	*Marine Mammal Adaptations* Discover Marine Mammal Adaptations	Final Editing
Day 11	*Community Question:* What is a challenge you have overcome? What did you do to overcome it? *Community Building Activity:* N/A	*Marine Mammal Conservation* Genetics and Conservation	Review of Edits
Day 12	*Community Question:* How could having a mentor in the future help you to succeed? *Community Building Activity:* High School Scenario	*Practical Exam* Final Preparations for Practical	Practice Reading

Syllabus- Internal

Day 1:

Time	Activity	Schedule
45 minutes	Community Building	9:00 – 9:45AM
150 minutes	Ocean Discovery Leadership Challenge Science Avatar Team Name Science Notebooks	9:45 – 12:15PM
15 minutes	Chores & Announcements	12:15 – 12:30PM
30 minutes	Lunch	12:30 – 1:00PM
60 minutes	PEN Program	1:00 – 2:00PM

Day 2:

Time	Activity	Schedule
45 minutes	Community Building	9:00 – 9:45AM
150 minutes	Living Lab Scavenger Hunt Living Lab Tour Mentor-Mentee Training	9:45 – 12:15PM
15 minutes	Chores & Announcements	12:15 – 12:30PM
30 minutes	Lunch	12:30 – 1:00PM
60 minutes	PEN Program	1:00 – 2:00PM

Day 3:

Time	Activity	Schedule
35 minutes	Community Building	9:00 – 9:35AM
35 minutes	Drive to Rocky Seashore	9:35 – 10:10AM
95 minutes	Rocky Seashore Exploration	10:10 – 11:45AM
15 minutes	Thank-you's	11:45 – 12:00PM
25 minutes	Lunch	12:00 – 12:25PM
35 minutes	Drive to Living Lab	12:25 – 1:00PM
60 minutes	PEN Program	1:00 – 2:00PM

Day 4:

Time	Activity	Schedule
45 minutes	Community Building	9:00 – 9:45AM
30 minutes	Invertebrate Lecture & Concept Map #1	9:45 – 10:15AM
90 minutes	Invertebrate Adaptation Lab	10:15 – 11:45AM
30 minutes	Office Hours #1	11:45 – 12:15PM
15 minutes	Chores & Announcements	12:15– 12:30PM
30 minutes	Lunch	12:30 – 1:00PM
60 minutes	PEN Program	1:00 – 2:00PM

Day 5:

Time	Activity	Schedule
45 minutes	Community Building	9:00 – 9:45AM
30 minutes	Science Leader Interview	9:45 – 10:15AM
90 minutes	Canyon Invertebrates & Invasive Removal	10:15 – 11:45AM
30 minutes	Conservation Message: Invertebrates	11:45 – 12:15PM
15 minutes	Chores & Announcements	12:15 – 12:30PM
30 minutes	Lunch	12:30 – 1:00PM
60 minutes	PEN Program	1:00 – 2:00PM

Day 6:

Time	Activity	Schedule
45 minutes	Community Building	9:00 – 9:45AM
75 minutes	Shark and Bony Fish Dissection	9:45 – 11:00AM
30 minutes	Fish Lecture & Concept Map #2	11:00 – 11:30AM
30 minutes	Study Hall #1	11:30 – 12:00PM
15 minutes	Thank You's	12:00 – 12:15PM
15 minutes	Chores & Announcements	12:15 – 12:30PM
30 minutes	Lunch	12:30 – 1:00PM
60 minutes	PEN Program	1:00 – 2:00PM

Day 7:

Time	Activity	Schedule
45 minutes	Community Building	9:00 – 9:45AM
35 minutes	Drive to Birch Aquarium	9:45 – 10:20AM
70 minutes	Fish Morphology Lesson Free Exploration of Aquarium	10:20 – 11:30AM
30 minutes	Fish Concept Map Expansion & Study Hall #2	11:30 – 12:00PM

25 minutes	Lunch	12:00 – 12:25PM
35 minutes	Drive to Living Lab	12:25 – 1:00PM
60 minutes	PEN Program	1:00 – 2:00PM

Day 8:

Time	Activity	Schedule
35 minutes	Community Building	9:00 – 9:35AM
30 minutes	Drive to Living Coast Discovery Center	9:35 – 10:05AM
40 minutes	Meeting with Science Leader & Fish Conservation	10:05 – 10:45AM
5 minutes	Transition between activities	10:45 – 10:50AM
40 minutes	Humans vs. Sharks & Shark and Ray Exhibit	10:50 – 11:30AM
30 minutes	Conservation Message: Fish	11:30 – 12:00PM
30 minutes	Lunch	12:00 – 12:30PM
30 minutes	Drive back to Living Lab	12:30 – 1:00PM
60 minutes	PEN Program	1:00 – 2:00PM

Day 9:

Time	Activity	Schedule
45 minutes	Community Building	9:00 – 9:45AM
30 minutes	Marine Mammal Lecture & Concept Map #3	9:45 – 10:15AM
75 minutes	Marine Mammal Mural	10:15 – 11:30AM
30 minutes	Office Hours #2	11:30 – 12:00PM
15 minutes	Thank You's	12:00 – 12:15PM
15 minutes	Chores & Announcements	12:15 – 12:30PM
25 minutes	Lunch	12:30 – 1:00PM
60 minutes	PEN Program	1:00 – 2:00PM

Day 10:

Time	Activity	Schedule
45 minutes	Community Building	9:00 – 9:45AM
90 minutes	Marine Mammal Adaptation Activities	9:45 – 11:15AM
30 minutes	Marine Mammal Concept Map Expansion	11:15 – 11:45AM
30 minutes	Study Hall #3	11:45– 12:15PM
15 minutes	Chores & Announcements	12:15 – 12:30PM
25 minutes	Lunch	12:30 – 1:00PM
120 minutes	PEN Program	1:00 – 2:00PM

Day 11:

Time	Activity	Schedule
45 minutes	Community Building	9:00 – 9:45AM
30 minutes	Zoom Meeting with Science Leader	9:45 – 10:15AM
90 minutes	Genetics and Conservation Lab & Ask Me What a Science Leader Does T-shirt	10:15 – 11:45AM
30 minutes	Conservation Message: Marine Mammals	11:45 – 12:15PM
15 minutes	Chores & Announcements	12:15 – 12:30PM
30 minutes	Lunch	12:30 – 1:00PM
60 minutes	PEN Program	1:00 – 2:00PM

Day 12:

Time	Activity	Schedule
45 minutes	Community Building	9:00 – 9:45AM
30 minutes	Office Hours #3	9:45 – 10:15AM
30 minutes	Study Hall #4	10:15 – 10:45AM
30 minutes	I AM Poems	10:45 – 11:15AM
45 minutes	Practical & Believe Survey	11:15 – 12:00PM
15 minutes	Thank You's	12:00 – 12:15PM
15 minutes	Chores & Announcements	12:15 – 12:30PM
25 minutes	Lunch	12:30 – 1:00PM
60 minutes	PEN Program	1:00 – 2:00PM
60 minutes	Prep for Family Celebration	2:00 – 3:00PM
120 minutes	Students dismissed	3:00 – 5:00PM
60 minutes	Family Celebration	5:00 – 6:30PM

Community Building

General

Goals: To introduce students to the culture, community, and traditions of Ocean Discovery Institute.

- Food & Conversation: To build community amongst students, all Ocean Discovery staff, and Mentors through a shared experience of food and conversation.
- Community Building Activity: To build students' belief that they are a unique individual and a member of the Ocean Discovery family.
- Announcements: To share the daily schedule and introduce anyone visiting or participating in the program.

Supplies (for everyday):

- Small white board (3)
- Small white board easel (3)
- Dry erase marker (3)
- Dry erase eraser or cloth (3)
- Easel for "My Plate" poster (3)
- Hand sanitizer (6)
- Breakfast food (1/student)
- Large digital timer (3)
- Spray bottles (1/table)
- Cleaning rags (1/table)
- Name tags (1/person)

Visuals (for everyday):

- My Plate

Set Up

- In each of the spaces (outdoor amphitheater, patio, and Living Roof) set up:
  - Tables and chairs for eating (socially distanced – 3 feet/person).
  - Garbage bag and recycling bag.
  - My Plate poster on easel near food.
  - Whiteboard and easel where everyone can see it.
    - Write Community Question at the top (see below curriculum).
    - Write the Daily Schedule below (see below curriculum).
  - Breakfast food.
  - Two bottles of hand sanitizer.
    - Two near breakfast food.
- Print out name tags and leave at check-in area
- iPod Songs Prepped for Transitions
  - Best Day of My Life – American Authors (Transition: Community Building to Science Labs)
  - Get up Offa That Thing – James Brown (Transition: Science Labs to Chores)
  - World is ours- Aloe Blacc (Transition: Lunch to PEN Program)
- Discuss floor management with mentors.
  - Assign one mentor to each monitor handwashing in each science lab location.

Intensive Program Manager

- Lead all portions of Food & Conversation, Community Building Activity, and Morning Announcements.
- Cue music for transition to Science Labs.
- Be present at Check In to answer parent questions/concerns.

Teaching Notes for Team Lead

- Help students stay social distanced at all times.
- **Always be thinking about ASC – Accountability-Safety-Communication.**

Check In: (15 min)
As student arrive have them:

- Check in & give students a name tag.
- Direct student to wash their hands in their Science Lab locations then report to the kitchen.
- Practice their Networking Skills with new people (beginning after Day 2).

Community Building

Day 1

Goals: To introduce students to the culture, community, and traditions of Ocean Discovery Institute.

- Food & Conversation: To build community amongst students, all Ocean Discovery staff, and Mentors through a shared experience of food and conversation
- Community Building Activity: To build students' belief that they are a unique individual and a member of the Ocean Discovery family.
- Announcements: To share the daily schedule and introduce anyone visiting or participating in the program.

Timing: 45 minutes

Time	Activity
9:00 – 9:30	Food & Conversation
9:30 – 9:40	Community Building Activity
9:40 – 9:45	Announcements

Supplies:

- Banana Bread supplies (1 slice/person)
- Small paper plates (1/person)
- Knife (1)
- Cutting board (1)
- Curiosity Cards LI Program Level 1 (12 sets)
    - Papi/Master Files/Curriculum/LI New/Curiosity Cards

Set Up

- Begin baking banana bread so that it will be ready by 9AM.
- Place a cutting board and knife next to banana bread station for IPM.
- Place paper plates at each Community Building location for banana bread.
- Have a set of curiosity cards at each Community Building location.

Intensive Program Manager

- Greet and orient all new Mentors
    - Share curriculum
    - Tour Science Lab space
    - Introduce them to their Team Lead
- Greet families as they arrive and talk to any parents with concerns.
- Cut up and deliver banana bread to each Community Building location.

Teaching Notes for Team Lead

- Introduce new mentors at Community Building during Announcements.
- During the Curiosity Card Activity:
  - Place a curiosity card in the center of each group.
  - Be sure to take a turn with the curiosity card and share about yourself.
  - During debrief collect curiosity cards.

Mentors

- Be sure there is at least one adult per table for all activities.
- Participate in all activities.
- Encourage inclusion and participation among students.
- During Food & Conversation you have a **Mentoring opportunity**.
  - Be sure to share something about yourself related to the Community Question and ask students follow up questions related to their responses.
    - Ex. Who prepares that food in your family?
    - Ex. I've never eaten that, can you tell me what's in it?
    - Ex. Is there a day of the week or special time of the year when you have that food?
    - Ex. What other foods do you enjoy?
- During the Curiosity Card Activity you have a **Mentoring opportunity.**
  - Be sure to take a turn with the curiosity card and share about yourself.
- During Announcements all mentors will have the opportunity to introduce themselves. This is meant to be very brief, 2-3 sentences per person.
  - Your name and school you currently attend or graduated from.
  - Current career and employer.
  - Former experience with Ocean Discovery Institute (if any).
    - Ocean Discovery alumni (say which programs you participated in).)
    - Previous programs you have participated in as a mentor or other.
- **Always be thinking about ASC – Accountability-Safety-Communication.**

Food & Conversation: (30 min)

Community Question: What are some of your favorite foods that your family makes? *
**The community question can always be subbed out if there is something the group needs to address.*

Intro:

- Be sure to cover the following:
  - Purpose of Food and Conversation:
    - Sharing food and conversation is a tradition across all cultures and it is a tradition here at Ocean Discovery Institute.
    - Each day we will meet here in the kitchen to have a snack and talk.
    - It is an opportunity to meet other Ocean Discovery staff who are not directly involved with the program and the other instructors and mentors not in your group.
  - Community Question:

- Each day there will be a question on the board for you to discuss with the people at your table.
  - (Show everyone where to find question.)
  - (Read today's question out loud.)
- Be sure everyone at your table gets a chance to share.
- Since we are eating together as a family, we will do a group clean-up all together at the end of breakfast so please stay seated and keep your plates and any trash on the table until it is clean-up time.

- Banana Bread:
  - Today is an extra special day.
  - The Living Lab is like a home and we like to make something in the kitchen to create the feeling of home or family – at Ocean Discovery it is our tradition to make banana bread.
- (Invite students & adults to come up and get food and a piece of banana bread one table at a time.)

Closing: (last 5 minutes)

- Be sure to include:
  - Review Purpose of Food and Conversation:
    - Getting to know other Ocean Discovery staff, students and mentors.
      - Ex. I hope you enjoyed getting to know some members of your Ocean Discovery family and maybe learning about some favorite foods you have in common or some new foods you might like to try.
  - Clean-up Policy:
    - Everyone to take their own trash to the garbage.
    - Separate recyclables and place in the recycle bin.
      - (Point to recycle bin.)
    - Sanitize hands.
      - (Point to hand sanitizer.)
    - One person per table to grab a rag and spray-bottle to clean table. Wipe crumbs into your hands not onto the floor.
    - Push in all chairs at the table.
    - Once you have taken your trash to the garbage please find a seat at a different table with some new people you don't know yet. There needs to be at least one adult per table.
  - Prepare for Clean-up:
    - Have each table nominate one person to get spray bottle and rag to clean off table.
      - (Give 30 seconds for each table to figure out who this is.)
    - Make sure each table has someone to do this.
      - Ex. Raise your hand if you are getting the spray bottle and cleaning your table. (Do a quick scan to check that each table has someone).
    - We have three minutes to accomplish this and get everyone back to their seats.
      - (Set large digital timer for 3 minutes)
      - (Release everyone to work.)

Community Building Activity: Curiosity Cards (10 min)

Intro: (2 min)

- Purpose of Community Building Activity:
    - Every morning after breakfast we will do a short community building activity so that we can get to know each other as unique individuals and find similarities within the group.

- Community Building Activity & Directions:
    - Since this is our first day as a group, we want to take more time getting to know each other.
    - Today we will do that using curiosity cards.
        - Choose a person to start.
        - They will pick a random curiosity card from the pile at the center of the table.
        - Read the question out load to the group and then respond to it.
        - There are no right or wrong answers.
        - When you are finished the person to your left will do the same thing.
        - It's okay if the same question comes up more than once.
        - If everyone gets to answer a question and you have additional time go around the table again with everyone picking a new card.

Activity: (7 min)

Closing: (1 min)

- Review Purpose of Community Building Activity:
    - Students are unique individuals who belong to the Ocean Discovery family.
        - Ex. I hope you enjoyed getting to know some more new Ocean Discovery family members and just like your own family, finding out things you have in common and some ways that you are different.

Announcements: (5 min)

- Purpose of Announcements:
    - Each morning we will review the daily agenda, so you know what to expect throughout the day.
        - (Read today's agenda out loud.)
- Introductions:
    - We will also use this time for anyone new to introduce themselves.
    - IPM to give powerful introduction for any adults joining the program followed by person giving a more personal introduction.
- Introduce Science Lab Transition:
    - We use musical cues to signal transitions at Ocean Discovery.
    - Starting tomorrow you will need to be in your group's science lab meeting space by the end of the musical cue.
    - Today we will walk down together so you know where your meeting space is.
    - (Divide students into groups.)
    - (IPM to start musical cue.)
    - Have groups join their Team Lead/Assistant Team Lead/Mentors and walk down to science lab space together.

Community Building

Day 2

Goals: See Day 1

Timing: 45 minutes

Time	Activity
9:00 – 9:30	Food & Conversation
9:30 – 9:40	Community Building Activity
9:40 – 9:45	Announcements

Supplies:

- N/A

Set Up

- None. See general notes.

Teaching Notes for Assistant Team Lead

- During the Community Building Activity**:**
  - Shake hands and introduce yourself after students have done so.

Mentors

- Be sure there is at least one adult per table for all activities.
- Participate in all activities.
- Encourage inclusion and participation.
- During Food & Conversation you have a **Mentoring opportunity**.
  - Be sure to share something about yourself related to the Community Question and ask students follow up questions related to their responses.
    - Ex. Why are you grateful for that?
    - Ex. Do you ever tell that person how grateful you are? Why or why not?
- During the Community Building Activity**:**
  - Shake hands and introduce yourself after students have done so.
- **Always be thinking about ASC – Accountability-Safety-Communication.**

Food & Conversation: (30 min)
Community Question: *What is one thing you are grateful for*?

Intro:

- Be sure to cover the following:
  - Purpose of Food and Conversation: *see Day 1*

- Community Question: *see Day 1*

- (Invite students and adults to come up and get food <u>one table at a time</u>.)

<u>Closing:</u> (last 5 minutes)

- Be sure to cover the following:
  - Review Purpose of Food and Conversation: *see Day 1*
  - Encourage meeting new people:
    - Ex. Please remember that breakfast is an opportunity to meet someone new. Leaders are always looking to learn from someone they don't know. Do your best to try and sit with someone new at breakfast tomorrow. While it can be a bit intimidating it can also be an opportunity to meet a new friend or mentor.
  - Review Clean-up Policy: *see Day 1*
  - Prepare for Clean-up: *see Day 1*
- We have three minutes to accomplish this and get everyone back to their seats.
  - (Set large digital timer for 3 minutes)
  - (Release everyone to work.)

Community Building Activity: Networking (10 min)

<u>Intro</u> (5 min):

- Be sure to cover the following:
  - Purpose of Community Building Activity: see Day 1
- Community Building Activity: Networking
  - Importance of building real world connections with other people and scientists.
  - Scientists communicate- they share information. To do that you need to be comfortable with meeting new people.
  - While meeting new people can feel intimidating it is important because it means YOU are approaching the world, you are not waiting for the world to approach you – it's proactive!
  - If this doesn't sound like you, it's okay to "Fake it till you are it!". Confidence can be built over time.
  - Learning how to formally introduce yourself will help you to build confidence.
  - Introduce introductions:
    - You want to give a short introduction so people know who you are.
      - Make eye contact.
      - Smile.
      - Introduction:
        - Ex: My name is _____. I'm an Ocean Leader. It's nice to meet you.
        - This is an example you can create your own introduction be sure it includes your name and that you are an Ocean Leader.
- Community Building Activity Directions:
  - Practice builds confidence.
  - Find three students and one adult in your science lab group to practice your introduction with.
  - Be back to your place in the circle at the end of two minutes.
  - (Set timer for two minutes and release everyone.)

Activity (2 min):

- (Set timer for two minutes and release students to work.)

Debrief (3 min):

- Review Purpose of Community Building Activity:
    - Focus on the idea that they are a unique individual who belong to the Ocean Discovery family.
    - Potential questions include:
        - How did you feel when you were introducing yourself?
            - (Whatever the student response, ask the group if they felt similarly, to raise their hand.)
        - Did anyone feel a different way?
        - What was the most difficult part for you: speaking, making eye contact, or smiling?
            - (Whatever the student response, ask the group if they felt similarly, to raise their hand.)
- We will be practicing making introductions throughout the program. You will meet many new scientists throughout the program- remember- be proactive! Try and approach them first rather than waiting from them to come to you.
- Tomorrow before breakfast try to introduce yourself to one adult you don't know.

Announcements: (5 min)

- Be sure to review:
    - Purpose of Announcements
        - (Read today's agenda out loud.)
    - Introductions
        - (If new adults are joining for the day.)
- Remind students of Science Lab Transition. Be sure to cover:
    - You need to be down in your group's science lab meeting space by the end of the song.
    - (Start musical cue and release students.)

Community Building

Day 3

Goals: See Day 1

Timing: 35 minutes

Time	Activity
9:00 – 9:30	Food & Conversation
9:30 – 9:35	Announcements

Supplies:

- Thank You Speech card (6)

Set Up

- Place 1-2 Thank You Speech cards off in each Community Building location to be handed out during Food & Conversation.

Teaching Notes for Team Lead

- Encourage students to use their new networking skill – introductions.
- During Food and Conversation choose two students to do a thank you for each mentor in your group.
  - Prep the students by explaining that at lunch today they will stand up with one of the mentors and say why they are thankful for having that person spend the last three days with the group.
  - Give the student the "Thank You Speech" card and explain they can use that to help them plan what they want to say.
  - If time allows practice speech with student.

Mentors

- Encourage students to use their new networking skill – introductions.
- Be sure there is at least one adult per table for all activities.
- Participate in all activities.
- Encourage inclusion and participation.
  - Sit with any student who is alone and encourage other students to sit with you.
  - Ask questions to get quieter students involved in the conversation.
- During Food & Conversation you have a **Mentoring opportunity**.
  - Be sure to share something about yourself related to the Community Question and ask students follow up questions related to their responses.
    - Ex. Where did you learn that?
    - Ex. What is something you think you have in common with a lot of people?
- **Always be thinking about ASC – Accountability-Safety-Communication.**

Food & Conversation: (30 min)
Community Question: What is something about you that you think is unique?

Intro:

- (As students enter for the program encourage them to sit with someone new.)
- Be sure to cover the following:
    - Purpose of Food and Conversation
    - Community Question
- (Invite students and adults to come up and get food one table at a time.)

Closing: (last 5 minutes)

- Be sure to cover the following:
    - Review Purpose of Food and Conversation
    - Review Clean-up Policy
    - Prepare for Clean-up

Announcements: (5 min)

Intro:

- Be sure to include the following:
    - Skipping the after-breakfast activity because we are going on a field trip.
    - Introductions
        - (If new adults are joining for the day.)
    - Review agenda and safety protocols for bus.
        - Observe COVID protocols for seating:
            - Sit three feet apart.
            - One person/seat.
            - Alternate rows.
            - At least 10 windows need to be open.
        - Stay seated throughout the ride.
        - Be respectful of the bus driver.
        - Represent yourself as an Ocean Leader today. Use your networking skills- introduce yourself to new people.
    - (Start musical cue and release students.)

Community Building

Day 4

Goals: See Day 1

Timing: 45 minutes

Time	Activity
9:00 – 9:30	Food & Conversation
9:30 – 9:40	Community Building Activity
9:40 – 9:45	Announcements

Supplies:

- Curiosity Cards LI Program Level 2 (8 sets)
  - Papi/Master Files/Curriculum/LI New/Curiosity Cards

Set Up

- Place a deck of curiosity cards in each Community Building location.

Intensive Program Manager

- Greet and orient new mentors.
  - Assign all Mentors to "Office Hours" locations.
  - Review the concept of "Office Hours" with mentors – they will have a group of 3-4 students they will be working with individually (see green box below).

Teaching Notes Team Lead

- Encourage students to use their new networking skill – introductions.
- During the Curiosity Card Activity:
  - Place a deck of curiosity cards in the center of each table during intro.
  - Be sure to take a curiosity card and share something about yourself.
  - During debrief collect curiosity cards.
- Introduce new mentors at Community Building during Announcements.

Mentors

- Students will be practicing their new networking skill – introductions.
  - Encourage them by introducing yourself first.
- Be sure there is at least one adult per table for all activities.
- Participate in all activities.
- Encourage inclusion and participation.
  - Sit with any student who is alone and encourage other students to sit with you.
  - Ask questions to get quieter students involved in the conversation.
- During Food & Conversation you have a **Mentoring opportunity**.
  - Be sure to share something about yourself related to the Community Question and ask students follow up questions related to their responses.
    - Ex. Do all members of your family enjoy participating?
    - Ex. Would you want to share this activity with your future family?
- During the Curiosity Card Activity you have a **Mentoring opportunity.**
  - Be sure to take a curiosity card and share something about yourself.
- **Always be thinking about ASC – Accountability-Safety-Communication.**

Food & Conversation: (30 min)
Community Question*: Yesterday we had the opportunity to explore a natural environment. What is something you enjoy doing with your family outdoors or in nature? **

Intro:

- (As students enter for the program encourage them to sit with someone new.)
- **New Mentors** - be sure to cover the following:
    - Purpose of Food and Conversation
    - Community Question
- (Invite students and adults to come up and get food one table at a time.)

Closing: (last 5 minutes)

- **New Mentors**- be sure to cover the following:
    - Review Purpose of Food and Conversation
    - Review Clean-up Policy:
- Prepare for Clean-up
- Three minutes for clean-up and get everyone back to their seats.
    - (Set large digital timer for 3 minutes)
    - (Release everyone to work.)

Community Building Activity: Curiosity Cards (10 min)

- See Day 1

Announcements: (5 min)

- Be sure to review:
    - Purpose of Announcements.
    - (Read today's agenda out loud.)
- Introductions:
    - Introduce new mentors.
        - IPM to give powerful introduction for any adults joining the program followed by person giving a more personal introduction.
- Remind students of Science Lab Transition. Be sure to cover:
    - You need to be down in your group's science lab meeting space with your science notebook by the end of the song.
- (Start musical cue and release students.)

Community Building

Day 5

Goals: See Day 1

Timing: 45 minutes

Time	Activity
9:00 – 9:30	Food & Conversation
9:30 – 9:40	Community Building Activity
9:40 – 9:45	Announcements

Supplies:

- None

Set Up

- None. See general notes.

Teaching Notes Team Lead

- Encourage students to use their new networking skills.

Mentors

- Students will be practicing their new networking skill – introductions.
  - Encourage them by introducing yourself first.
- Be sure there is at least one adult per table for all activities.
- Participate in all activities.
- Encourage inclusion and participation.
  - Sit with any student who is alone and encourage other students to sit with you.
  - Ask questions to get quieter students involved in the conversation.
- During Food & Conversation you have a **Mentoring opportunity**.
  - Be sure to share something about yourself related to the Community Question and ask students follow up questions related to their responses.
    - Ex. What is something you will be doing five years from now that you are excited about?
    - Ex. What do you think will be more challenging about your life five years from now?
    - Ex. Is there anything you are doing now that will help you get where you want to be five years from now?
- **Always be thinking about ASC – Accountability-Safety-Communication.**

Food & Conversation: (30 min)
Community Question: *Five years from now how do you think your life will be different? **

Intro:
- (As students enter for the program encourage them to sit with someone new.)
- Be sure to cover the following:
    - Purpose of Food and Conversation
    - Community Question

Closing: (last 5 minutes)
- Be sure to cover the following:
    - Review Purpose of Food and Conversation
    - Review Clean-up Policy
    - Prepare for Clean-up

Community Building Activity: Would You Rather (10 min)
Intro: (2 min)
- Be sure to cover the following:
    - Today we will be playing a game to see how many similarities and differences we have with each other.
        - We will all start out in a line in the center.
        - I read a question out loud. Depending on your answer you will walk to one side or the other.
        - We will have a chance to see the things we have in common and things that make us unique.
        - Try to answer the questions as honestly as possible.

Activity: (7 min)
- (Line students up in the center.)
- Read a question and depending on their answer have students move to one side or the other, than turn and face each other.
- Ask 2-3 students to elaborate on responses after each question.
- Potential questions include:
    - Would you rather get up early or sleep late?
    - Would you rather watch TV or go to the movies?
    - Are you more of an introvert or an extrovert?
    - Which meal do you prefer: breakfast or dinner?
    - Would you rather be able to talk with animals or hear other people's thoughts?
    - Do you prefer to work in a group or alone?
    - Would you rather be 3'9" or 7'8'"
    - Would you rather be President of the United States or a movie star?
    - Would you rather be able to breathe underwater or fly through the air?
    - Are you the type of person who sings out loud or silently mouths the words to your favorite songs?

Closing: (1 min)

- Be sure to cover the following:
    - Thank you for sharing everyone!
    - It's great to see some of the ways we are similar and some of the ways we are unique. These similarities and differences are what creates diversity in the world. It is so important that the next generation of science leaders be diverse!

Announcements: (5 min)

- Be sure to include the following:
    - Skipping the after-breakfast activity because we are going on a field trip.
    - Introductions
        - (If new adults are joining for the day.)
    - Review agenda and safety protocols for bus: see Day 3
    - (Start musical cue and release students.)

Community Building

Day 6

Goals: See Day 1

Timing: 45 minutes

Time	Activity
9:00 – 9:30	Food & Conversation
9:30 – 9:40	Community Building Activity
9:40 – 9:45	Announcements

Supplies:

- Thank You Speech card (6)

Set Up

- N/A

Teaching Notes for Team Lead

- Encourage students to use their new networking skill – introductions.
- During Food and Conversation choose two students to do a thank you for each mentor in your group.
    - Prep the students by explaining that at lunch today they will stand up with one of the mentors and say why they are thankful for having that person spend the last three days with the group.
    - Give the student the "Thank You Speech" card and explain they can use that to help them plan what they want to say.
    - If time allows practice speech with student.

Mentors

- Encourage students to continue practicing their networking skills.
- Be sure there is at least one adult per table for all activities.
- Participate in all activities.
- Encourage inclusion and participation.
    - Sit with any student who is alone and encourage other students to sit with you.
    - Ask questions to get quieter students involved in the conversation.
- During Food & Conversation you have a **Mentoring opportunity**.
    - Be sure to share something about yourself related to the Community Question and ask students follow up questions related to their responses.
        - Ex. What can you do to help alleviate some of your nervousness?
- During the Community Building Activity**:**
    - Shake hands and introduce yourself after students have done so.
- **Always be thinking about ASC – Accountability-Safety-Communication.**

Food & Conversation: (30 min)
Community Question: *What is one thing you are excited about for our field trip to the Birch Aquarium **

Intro:
- Be sure to cover the following:
    - Purpose of Food and Conversation
    - Community Question

Closing: (last 5 minutes)
- Be sure to cover the following:
    - Review Purpose of Food and Conversation
    - Review Clean-up Policy
    - Prepare for Clean-up

Community Building Activity: Networking (10 min)

Intro (5 min):
- Be sure to cover the following:
    - Purpose of Community Building Activity
    - Review Importance of Networking: see Day 2
        - Review hand shaking:
            - Make eye contact.
            - Smile.
            - Introduction:
                - Ex: My name is _____. I'm an Ocean Leader. It's nice to meet you.
                - This is an example you can create your own introduction be sure it includes your name and that you are an Ocean Leader.
    - Community Building Activity Directions:
        - Practice builds confidence.
        - Find three students and one adult NOT in your science lab group to practice your introduction with.
        - Focus on: Making eye contact. Smiling.
        - (Set timer for three minutes and release everyone.)
    - You have 2 minutes to walk around and introduce yourself to 2 students and 1 mentor.
        - Be back to your place in the circle at the end of two minutes.

Activity (2 min):
- (Set timer for two minutes and release students to work.)

Debrief (3 min):
- Review Purpose of Community Building Activity:
    - They are a unique individual who belong to the Ocean Discovery family.
    - Potential questions include:
        - How did you feel when you were introducing yourself this time? Same or easier?

        - (Whatever the student response is ask the group if they felt similarly to raise their hand.)
    - Did anyone feel a different way?
    - Have you introduced yourself to someone without being asked? Who? How did it feel?
- We will continue practicing introductions.
    - Tomorrow you will have a new group of mentors. Try and introduce yourself to at least one new adult before breakfast tomorrow.

Announcements: (5 min)

- Be sure to review:
    - Purpose of Announcements.
    - (Read today's agenda out loud.)
- Introductions
    - (If new adults are joining for the day.)
- Remind students of Science Lab Transition. Be sure to cover:
    - You need to be down in your group's science lab meeting space with your science notebook by the end of the song.
- (Start musical cue and release students.)

Community Building

Day 7

Goals: See Day 1

Timing: 45 minutes

Time	Activity
9:00 – 9:30	Food & Conversation
9:30 – 9:40	Community Building Activity
9:40 – 9:45	Announcements

Supplies:

- Curiosity Cards LI Program Level 2 (8 sets)
  - Papi/Master Files/Curriculum/LI New/Curiosity Cards

Set Up

- Place a deck of curiosity cards at each Community Building location.

Intensive Program Manager

- Greet and orient all new Mentors
  - Share curriculum
  - Tour Science Lab space
  - Introduce them to their Team Lead

Teaching Notes Team Lead

- Encourage students to use their new networking skills.
- During the Curiosity Card Activity:
  - Place a deck of curiosity cards in the center of each table during intro.
  - Be sure to take a curiosity card and share something about yourself.
  - During debrief collect curiosity cards.

Mentors

- Students will be practicing their new networking skills – introductions.
  - Encourage them by introducing yourself first.
- Be sure there is at least one adult per table for all activities.
- Participate in all activities.
- Encourage inclusion and participation.
  - Sit with any student who is alone and encourage other students to sit with you.
  - Ask questions to get quieter students involved in the conversation.
- During Food & Conversation you have a **Mentoring opportunity**.
  - Be sure to share something about yourself related to the Community Question and ask students follow up questions related to their responses.
    - Ex. Do all members of your family enjoy participating?
    - Ex. Would you want to share this activity with your future family?
- During the Curiosity Card Activity you have a **Mentoring opportunity.**
  - Be sure to take a curiosity card and share something about yourself.
- **Always be thinking about ASC – Accountability-Safety-Communication.**

Food & Conversation: (30 min)
Community Question*: Over the last few days we have had the opportunity to explore nature and the outdoors. What is something you enjoy doing with your family outdoors or in nature?*

Intro:
- (As students enter for the program encourage them to sit with someone new.)
- **New Mentors** - be sure to cover the following:
    - Purpose of Food and Conversation
    - Community Question
- (Invite students and adults to come up and get food one table at a time.)

Closing: (last 5 minutes)
- **New Mentors**- be sure to cover the following:
    - Review Purpose of Food and Conversation
    - Review Clean-up Policy:
- Prepare for Clean-up
- Three minutes for clean-up and get everyone back to their seats.
    - (Set large digital timer for 3 minutes)
    - (Release everyone to work.)

Community Building Activity: Curiosity Cards (10 min)
- See Day 1

Announcements: (5 min)
- Be sure to review:
    - Purpose of Announcements.
    - (Read today's agenda out loud.)
- Introductions:
    - Introduce new mentors.
        - IPM to give powerful introduction for any adults joining the program followed by person giving a more personal introduction.
- Review agenda and safety protocols for bus.
    - Observe COVID protocols for seating:
        - Sit three feet apart.
        - One person/seat.
        - Alternate rows.
        - At least 10 windows need to be open.
    - Stay seated throughout the ride.
    - Be respectful of the bus driver.
    - Represent yourself as an Ocean Leader today. Use your networking skills- introduce yourself to new people.
- (Start musical cue and release students.)

Community Building

Day 8

Goals: See Day 1

Timing: 35 minutes

Time	Activity
9:00 – 9:30	Food & Conversation
9:30 – 9:35	Announcements

Supplies:

- None

Set Up

- None. See general notes.

Teaching Notes Team Lead

- Encourage students to use their new networking skills.

Mentors

- Students will be practicing their new networking skill – introductions.
  - Encourage them by introducing yourself first.
- Be sure there is at least one adult per table for all activities.
- Participate in all activities.
- Encourage inclusion and participation.
  - Sit with any student who is alone and encourage other students to sit with you.
  - Ask questions to get quieter students involved in the conversation.
- During Food & Conversation you have a **Mentoring opportunity**.
  - Be sure to share something about yourself related to the Community Question and ask students follow up questions related to their responses.
    - Ex. Why are you excited about that?
    - Ex. What can you do to combat your nervousness?
    - Ex. Do you think other students are nervous about that too?
- **Always be thinking about ASC – Accountability-Safety-Communication.**

Food & Conversation: (30 min)

Community Question: *What are you most excited about starting high school? Nervous about?*

Intro:

- (As students enter for the program encourage them to sit with someone new.)
- Be sure to cover the following:
    - Purpose of Food and Conversation
    - Community Question

Closing: (last 5 minutes)

- Be sure to cover the following:
    - Review Purpose of Food and Conversation
    - Review Clean-up Policy
    - Prepare for Clean-up

Announcements: (5 min)

- Be sure to include the following:
    - Skipping the after-breakfast activity because we are going on a field trip.
    - Introductions
        - (If new adults are joining for the day.)
    - Review agenda and safety protocols for bus: see Day 3
    - (Start musical cue and release students.)

Community Building

Day 9

Goals: See Day 1

Timing: 45 minutes

Time	Activity
9:00 – 9:30	Food & Conversation
9:30 – 9:40	Community Building Activity
9:40 – 9:45	Announcements

Supplies:

- Thank You Speech card (6)

Set Up

- N/A

Teaching Notes for Team Lead

- Encourage students to use their new networking skills.
- During Food and Conversation choose two students to do a thank you for each mentor in your group.
  - Prep the students by explaining that at lunch today they will stand up with one of the mentors and say why they are thankful for having that person spend the last three days with the group.
  - Give the student the "Thank You Speech" card and explain they can use that to help them plan what they want to say.
  - If time allows practice speech with student.

Mentors

- Encourage students to continue practicing their networking skills- handshake and introduction.
- Be sure there is at least one adult per table for all activities.
- Participate in all activities.
- Encourage inclusion and participation.
- During Food & Conversation you have a **Mentoring opportunity**.
  - Be sure to share something about yourself related to the Community Question and ask students follow up questions related to their responses.
    - Ex. Why do you think that skill is important?
    - Ex. Do you already have that skill? Who would you ask to teach you? Who would you want to learn that skill from?
- During the Community Building Activity**:**
  - Shake hands and introduce yourself after students have done so.
- **Always be thinking about ASC – Accountability-Safety-Communication.**

Food & Conversation: (30 min)
Community Question: *What are some life skills you think everyone should learn*? *

Intro:
- Be sure to cover the following:
    - Purpose of Food and Conversation
    - Community Question

Closing: (last 5 minutes)
- Be sure to cover the following:
    - Review Purpose of Food and Conversation
    - Review Clean-up Policy
    - Prepare for Clean-up

Community Building Activity: Networking (10 min)

Intro (5 min):
- Be sure to cover the following:
    - Purpose of Community Building Activity
    - Review Importance of Networking: see Day 6
    - Review d introductions: see Day 6
- Introduce Thank You's
    - Importance of showing gratitude for someone who has worked with you or shared with you.
    - Similarity to introductions:
        - Make eye contact
        - Smile
        - Ex. Thank you for taking the time to work with me today. I really appreciate it.
            - When you are saying thank you be specific about how the person helped you.
- Community Building Activity Directions:
    - Practice builds confidence.
    - Find two adults you know and two adults you don't know to practice your thank you's with.
        - Be back to your place in the circle at the end of two minutes.

Activity (3 min):
- (Set timer for three minutes and release everyone.)

Debrief (2 min):
- Review Purpose of Community Building Activity:
    - They are a unique individual who belong to the Ocean Discovery family.
    - Potential questions include:
        - How did you feel when you were saying thank you?
            - (Whatever the student response, ask the group if they felt similarly, to raise their hand.)
        - Did anyone feel a different way?

        - Which is easier for you: introductions or thank-you's? Why?
            - (Whatever the student response, ask the group if they felt similarly, to raise their hand.)
    - Continue to use these networking skills especially when we have visiting scientists.

Announcements: (5 min)

- Be sure to review:
    - Purpose of Announcements.
    - (Read today's agenda out loud.)
- Introductions
    - (If new adults are joining for the day.)
- (Start musical cue and release students.)

Community Building

Day 10

Goals: See Day 1

Timing: 45 minutes

Time	Activity
9:00 – 9:30	Food & Conversation
9:30 – 9:40	Community Building Activity
9:40 – 9:45	Morning Announcements

Supplies:

- Curiosity Cards LI Program **Level 3** (8 sets)
  - Papi/Master Files/Curriculum/LI New/Curiosity Cards

Set Up

- Place a deck of curiosity cards in each Community Building location.

Intensive Program Manager

- Greet and orient all new Mentors
  - Share curriculum
  - Tour Science Lab space
  - Introduce them to their Team Lead

Teaching Notes for Team Lead

- Encourage students to use their new networking skills.
- During the Curiosity Card activity:
  - Place a deck ofo curiosity cards in the center of each table during intro.
  - Be sure to take a turn with the curiosity card and share about yourself.
  - During debrief collect curiosity cards.

Mentors

- Encourage students to use their networking skill –introduction.
- Be sure there is at least one adult per table for all activities.
- Participate in all activities.
- During Food & Conversation you have a **Mentoring opportunity**.
  - Share something about yourself related to the Community Question and ask follow up questions
    - Ex. What kind of things cause you stress?
    - Ex. Do you think stress is good or bad?
    - Ex. What other things do you do to help relieve stress?
  - Be sure to take a turn with the curiosity card and share about yourself.
- During the Curiosity Cards activity, you have a **Mentoring opportunity.**
  - Be sure to take a turn with the curiosity card and share about yourself.
- **Always be thinking about ASC – Accountability-Safety-Communication.**

Food & Conversation: (30 min)
Community Question: *What is one way you deal with stress to make yourself feel better?*

Intro:

- **New Mentors** - be sure to cover the following:
    - Purpose of Food and Conversation
    - Community Question

Closing: (last 5 minutes)

- **New Mentors**- be sure to cover the following:
    - Review Purpose of Food and Conversation
    - Review Clean-up Policy:
    - Prepare for Clean-up

Community Building Activity: Curiosity Cards (10 min)

- See Day 1

Announcements: (5 min)

- Be sure to review:
    - Purpose of Announcements.
    - (Read today's agenda out loud.)
- Introductions
    - (If new adults are joining for the day.)
- (Start musical cue and release students.)

Community Building

Day 11

Goals: See Day 1

Timing: 35 minutes

Time	Activity
9:00 – 9:30	Food & Conversation
9:30 – 9:40	Community Building Activity
9:40 – 9:45	Announcements

Supplies:

- N/A

Set Up

- None

Teaching Notes for Team Lead

- N/A

Mentors

- Encourage students to use their networking skills but introducing yourself first.
- Be sure there is at least one adult per table for all activities.
- Participate in all activities.
- Encourage inclusion and participation.
- During Food & Conversation you have a **Mentoring opportunity**.
    - Be sure to share something about yourself related to the Community Question and ask students follow up questions related to their responses.
        - Ex. Have you ever tried a new sport? Tried out for a play? Taken a new class you were nervous about?
- **Always be thinking about ASC – Accountability-Safety-Communication.**

Food & Conversation: (30 min)

Community Question: *What is a challenge you have overcome? What did you do to overcome it?*

Intro:

- Be sure to cover the following:
    - Purpose of Food and Conversation
    - Community Question

Closing: (last 5 minutes)

- Be sure to cover the following:
    - Review Purpose of Food and Conversation
    - Review Clean-up Policy
    - Prepare for Clean-up

Announcements: (5 min)

- Be sure to review:
    - Purpose of Announcements.
    - (Read today's agenda out loud.)
    - Bus safety protocol
- Introductions
    - (If new adults are joining for the day.)
- (Start musical cue and release students.)

Community Building

Day 12

Goals: See Day 1

Timing: 45 minutes

Time	Activity
9:00 – 9:30	Food & Conversation
9:30 – 9:40	Community Building Activity
9:40 – 9:45	Announcements

Supplies:

- High School Scenario cards (1/table in kitchen)
- Thank You Speech card (6)

Set Up

- Place High School Scenario cards off to side and ready to be used during Activity time.

Teaching Notes for Team Lead

- During Food and Conversation:
  - Choose two students to do a thank you for each mentor in your group.
    - Be sure to choose a student who has not done a personal thank you yet.
    - Give the student the "Thank You Speech" card and explain they can use that to help them plan what they want to say.
    - If time allows practice speech with student.
  - Talk to the students who have been chosen to give the PEN reflections from your group and make sure they are comfortable with the idea.
  - Let the two students in your group who will work the Conservation Tree know and make sure they are okay with the idea.
- During the Community Building Activity**:**
  - Be sure to share some experiences you might have had that are similar to Emile and how you dealt with those challenges yourself.
  - During the debrief collect cards High School Scenario cards.

Mentors

- Encourage students to use their networking skills.
- Participate in all activities.
- Encourage inclusion and participation.
- During Food & Conversation you have a **Mentoring opportunity**.
  - Be sure to share something about yourself related to the Community Question and ask students follow up questions related to their responses.
    - Ex. What things can a mentor help you with?
    - Ex. Do you think you could be a mentor to a younger person? What would you tell them?
- During the High School Scenario activity, you have a **Mentoring opportunity.**
  - Be sure to share some experiences you might have had that are similar to Emile and how you dealt with those challenges yourself.
- **Always be thinking about ASC – Accountability-Safety-Communication.**

Food & Conversation: (30 min)

Community Question: *How could having a mentor in the future help you to succeed?*

Intro:

- Be sure to cover the following:
    - Purpose of Food and Conversation
    - Community Question

Closing: (last 5 minutes)

- Be sure to cover the following:
    - Review Purpose of Food and Conversation
    - Review Clean-up Policy
    - Prepare for Clean-up

Community Building Activity: High School Scenario (10 min)

Intro: (1 min)

- Be sure to cover the following:
    - You will each be presented with a scenario which one of your mentors will read outload to the group.
    - After hearing the scenario there will be some questions to answer.

Activity: (7 min)

- High School Scenario:
    - *Prior to entering high school, Emile always got A's and B's in middle school. He was also involved in extracurricular activities like the soccer team, basketball team, and student government. Emile just finished his month in high school and is getting C's and D's in all his classes. He hasn't talked to any of his teachers because he is nervous and he hasn't joined any extracurricular activities because he is shy about meeting new people and feels a little intimidated about playing sports with older high school students.*

        - *Question 1: Have you ever experienced something similar? What did you do?*
        - *Question 2: Has there ever been a time when you felt like you were failing? What did you do? Would you do anything differently today?*
        - *Question 3 (if time allows): What advice would you give to Emile?*

Closing (2 min)

- Review Purpose of Community Building Activity:
    - They are a unique individual who belong to the Ocean Discovery family.
    - Potential questions include:
        - Have you ever experienced something similar to this scenario? What did you do about it?
            - (Whatever the student response, ask the group if they felt similarly, to raise their hand.)

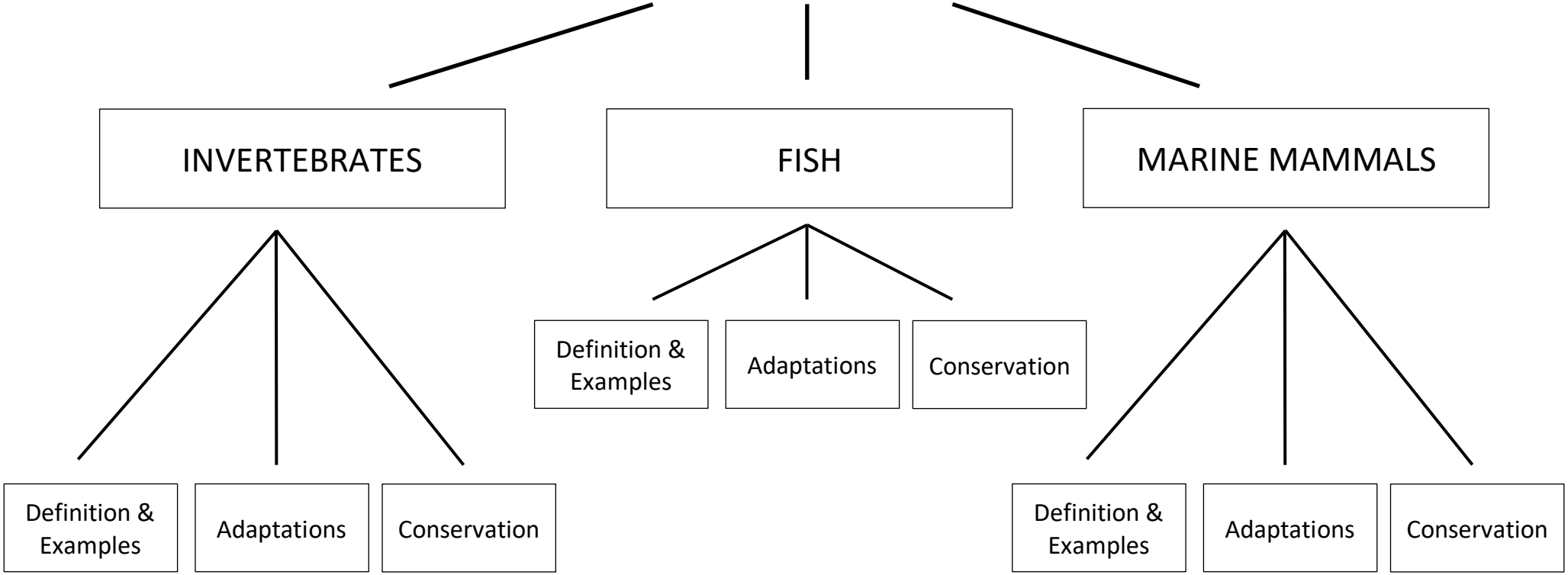
- Has there ever been a time when you felt like you were failing? What did you do? Would you do anything differently today?
    - (Whatever the student response, ask the group if they felt similarly, to raise their hand.)

Announcements: (5 min)

- Be sure to review:
    - Purpose of Announcements.
    - (Read today's agenda out loud.)
- Introductions
    - (If new adults are joining for the day.)
- (Start musical cue and release students.)

SCIENCE LABS

Bridge Program Concept Map



Science Labs

General

Set Up

- Discuss floor management plan with mentors.
- Load "LI Bridge Program PPT" and advance slide deck to the day's slides.
  - If a video will be shown - connect the speaker.
- Make sure student laptops are charged.

Intensive Program Manager

- Cue music transitions:
  - Get up Offa That Thing – James Brown (Transition: Science Labs to Chores)
  - World is ours- Aloe Blacc (Transition: Lunch to PEN Program)
- **Always be thinking about ASC – Accountability-Safety-Communication.**

Teaching Notes for Team Lead

- During the Chores & Announcements**:**
  - Remind students of any special items needed for the next day (especially for field trips).
- Utilize the Word Wall for new vocabulary.
- **Always be thinking about ASC – Accountability-Safety-Communication.**

Mentors

- Be sure there is at least one adult monitoring each table.
- Spread out amongst the students during all activities.
- Participate in all activities.
- During Science Labs you have a **Mentoring opportunity.**
  - Be sure to engage with students in your floor area by asking questions and providing guidance and positive reinforcement
    - Tell me more about that.
    - What do you observe? Wonder?
    - What questions do you have about….?
    - Do you notice any trends or patterns?
  - Engage and help students who are struggling (taking challenges and turning them into opportunities)
    - What are you finding challenging/difficult right now?
    - What can you do to get involved?
    - Let's think about how we can tackle this with a growth-oriented mindset. What could a next step be?
  - Share about your college and career pathway when appropriate.
- Share about your college and career pathway when appropriate.
- After Science Labs help students transition to Chores by the end of the musical cue.
- **Always be thinking about ASC – Accountability-Safety-Communication.**

Chores & Announcements

Goal: Students perform servant leadership by helping to clean up and organize the lab space in their Ocean Discovery home.

Supplies:

- Sanitizing wipe (1/student)

Timing:

15 minutes - occurs at the end of every science lab (occurring at the Living Lab)

- (Show Chores slide in Ocean Leader Bridge PowerPoint.)
- (Pass out a sanitizing wipe to each student.)
- Have students:
    - plug in and put away laptops (if used).
    - put away science notebooks.
    - place chairs on top of tables.
    - pick up any remaining trash on the floor

Science Labs

Day 1

Goals: Students learn about the pathway of becoming an Ocean Leader and get to know their Ocean Discovery family.

Timing:

Time	Activity	Schedule
45 minutes	Community Building	9:00 – 9:45AM
75 minutes	Ocean Discovery Leadership Challenge	9:45 – 12:15PM
40 minutes	Scientist Avatar	
15 minutes	Team Name	
20 minutes	Science Notebooks	
15 minutes	Chores & Announcements	12:15 – 12:30PM
30 minutes	Lunch	12:30 – 1:00PM
60 minutes	PEN Program	1:00 – 2:00PM

Supplies:

- Ocean Discovery Leadership Challenge
  - Fabric for armbands (1/student + 1/adult + 4 for Challenges)
    - Three different colors – one color for each group
  - Supply backpack (1/group)
    - Tape measure
  - Leave no trace backpack (1/group)
    - Canvas tote bag
  - Team Lead backpack (1/team lead)
    - Digital camera
    - Ocean Discovery Leadership Challenge: Clues & Challenges Card
  - Pieces of uncooked spaghetti (60)
  - Scotch tape roll (3)
  - String – 1 yard (3)
  - Marshmallow (3)
  - Laminated “Challenge #1” card (3)
  - Laminated “Challenge #2” card (3)
  - Laminated “Challenge #3” card (3)
  - Laminated “Challenge #4” card (1)
  - Large plastic storage bin (2)
  - Water balloons (1/2 students + 6 extra)
  - Small plastic art bins w/ lids (3)
    - Each labeled Yellow Team, Blue Team, or Green Team
  - Soft bags for “Nothing In Common Challenge” (9)
    - Inside each bag:
      - Blue crayon

- Penny
- Piece of red yarn
- Toy car (i.e. Matchbox Car or other)
- Cotton ball
- Rubber band
- Small votive candle
- Piece of chalk
- Spoon
- Screw
- Balloon

    - Prizes
        - Overall winner of Ocean Discovery Leadership Challenge (~10)
        - Winner of Marshmallow Challenge (~10)
- Scientist Avatar:
    - Laptop (1/student)
    - Sticker printing machine (1)
    - Sticker paper (30 sheets)
- Science Notebooks:
    - Science notebook (1/student)
    - Small plastic bin for art supplies (3/group)
    - Art supplies
        - Crayons
        - Markers
        - Glitter glue
        - Colored pencils
- Sharpies (for Word Wall) (2)

Visuals:

- Ocean Discovery Leadership Challenge PPT
- Word Wall
    - Large piece of butcher paper with “Word Wall” written largely on top
- Seed to Tree Ocean Discovery Alumni Video
    - Papi:/Curriculum/CI New

Set Up

- Load "Ocean Discovery Challenge PPT" so it is ready for pictures to be loaded from Ocean Discovery Challenge activity.
    - Papi://Curriculum/LI New/8th Grade OL Bridge
- Load and check sound on "Seed to Tree Ocean Discovery Alumni" video.
- Set up Ocean Leader Challenge in the canyon:
    - At each location 1:
        - Tie a matching color ribbon around a plant.
        - Place 20 sticks of spaghetti, one roll of tape, one yard of string, and one marshmallow.
        - Place laminated "Challenge #1" card.
    - At each location 2:
        - Fill water balloons.
        - Place water balloons in plastic storge bin and cover.
        - Place laminated "Challenge #2" card.
    - At each location 3:
        - Place three soft bags inside one small plastic art bin and put lid on top.
        - Place laminated "Challenge #3" card.
    - At location 4 (ODI Statue (Watershed Plaza) - same for all groups.)
        - Place laminated "Challenge #4" card at base of ODI Statue.
- In each Science Lab meeting location put to the side:
    - Color ribbons (1/student)
    - Prizes (1/student)
    - Science Notebooks (1/student)
    - Laptop (1/student)
        - Opened to this website: https://www.edfenergy.com/prettycurious/futureme/avatarbuilder
- Create art bins for Science Notebook decorating (3/group). Fill a small plastic bin with:
    - Crayons
    - Markers
    - Glitter glue
    - Colored pencils
- Set up sticker printer and sticker paper in one location where IPM will add team names to scientist avatars and print out stickers.
- Get IPM's phone number to send team name as a text during Team Name activity.

Intensive Program Manager

- Confirm with Anne and Dan Sullivan what visuals they will be using on Day 2.
- During Ocean Leader Challenge:
    - Collect digital cameras once teams have completed the challenge.
    - Upload pictures onto Ocean Discovery Challenge PPT and determine a winner for the Marshmallow Challenge and Water Balloon Toss.
- During Science Avatar debrief:
    - Find Science Avatar template and open on computer.
    - Add Group Names to Scientist Avatar pictures
    - Print scientist avatar stickers
    - Distribute stickers to each group (ideally before Science Notebook activity).

Teaching Notes for Team Lead

- During Ocean Discovery Challenge:
  - There should be an instructor in the front of the group and a mentor in the back for safety.
  - Encourage students to be competitive and have fun but ensure that they stay together as a group for collaboration.
  - Count the number of students as you go from challenge to challenge.
  - Keep students socially distanced during share-outs and challenges.
- During Marshmallow Challenge COVID adaptations:
  - Students make a socially distanced circle around materials.
  - When a student wants to do something with the structure- raise their hand.
  - Team Lead will call on students/mentors individually to work on the tower- each person gets a maximum time of 60 seconds before they have to let another student/mentor work on the structure.
- During Water Balloon Toss Challenge:
  - Make sure students pick up all the pieces of broken balloons.
- During Nothing in Common Challenge COVID adaptations:
  - Be sure groups are sitting socially distanced when working to create groups of objects.
- During Ocean Leader Challenge debrief:
  - During the debrief give the digital camera to the IPM to upload pictures onto Ocean Discovery Challenge PPT and determine a winner for the Marshmallow Challenge.
- During Science Avatar you have a **Mentoring opportunity.**
  - Be sure to engage with students in your floor area by asking questions and providing guidance and positive reinforcement
    - Tell me about your avatar.
    - Do you think being a scientist is something you are interested in?
    - Are there any future careers in science that interest you?
- During Team Name:
  - Text team name to Intensive Program Manager ASAP to be added to scientist avatar stickers.

Mentors

- During Ocean Leader Challenge participate in the sharing circles.
- During Science Avatar you have a **Mentoring opportunity.**
  - Be sure to engage with students in your floor area by asking questions and providing guidance and positive reinforcement
    - Tell me about your avatar.
    - Do you think being a scientist is something you are interested in?
    - Are there any future careers in science that interest you?
- During Team Name:
  - Help the students decide on a team name and cheer.
  - Encourage inclusivity, kindness, and respect during idea sharing.

Ocean Discovery Leadership Challenge: (75 min)

Goal: Students become familiar with the Seed to Tree pathway of an Ocean Leader while sharing about themselves and learning about other program participants.

Intro: (15 min)

- Introduce Ocean Discovery Family. Be sure to include:
  - Some are already part of the Ocean Discovery Family and some are new to the Ocean Discovery Family. Today everyone is a part of the Ocean Discovery family.
  - Over the next two weeks you will get to know each other, mentors and other Ocean Discovery staff as you learn about becoming a science and conservation leader.
- Introduce Seed to Tree pathway of an Ocean Leader. Be sure to include:
  - Importance of science and conservation leaders who come from City Heights.
    - Represent your community
    - Increase diversity in science and conservation fields
  - The "Seed to Tree Pathway" created by Ocean Discovery Institute helps students who are interested in becoming science leaders.
    - (Show Seed to Tree Pathway Graphic on OL Bridge PowerPoint.)
    - Students can join the pathway at any age
    - Pathway provides science programs (like this one), mentoring opportunities, and other tools for success like study skills, internships, and job opportunities.
- Introduce "Seed to Tree Ocean Discovery Alumni" video which highlights Ocean Discovery students in different places along their pathway to becoming science and conservation leaders.
  - (Show Seed to Tree Ocean Discovery Alumni video.)
- Debrief "Seed to Tree Ocean Discovery Alumni" video.
  - Potential questions include:
    - What do you have in common with some of the people you saw in the video?
    - Why do you think Ocean Discovery calls this a "Seed to Tree Pathway"?
    - How would you describe a science and conservation leader?
    - What did you see in the video that gets you excited?
- Debrief where students are on their pathway.
  - Today you continue or start on the Seed to Tree pathway by being an Ocean Leader by participating in the Bridge program.
  - You have been selected to be a part of a special group of leaders -Ocean Leaders because you have already shown leadership qualities.
  - Ways to go from a leader to a great leader starting today:
    - Ask questions/be curious
    - Participate in all activities
      - Even when things feel slightly uncomfortable- when we feel uncomfortable often, we are growing as a person.
    - Push yourself to meet new people- students and adults
    - Share what you learn with others
  - Ways to be a leader in the future - make a difference in the world
    - Mentor others
    - Transform your community
    - Save lives – medical research, cancer research

- Protect our planet

Ocean Discovery Leadership Challenge: (45 min)

- Introduce Ocean Discovery Challenge.
  - (Review Expectations slide on OL Bridge PowerPoint.)
  - As a family we will embark on the Ocean Discovery Challenge!
  - The Challenge requires your skills, speed, and teamwork.
- Prepare for the Challenge:
  - Give colored fabric ribbons to each student to wear.
    - The ribbons make us a team!
  - Assigns roles 1) supply backpack and 2) leave-no-trace pack
    - The supply pack has the items you need to complete challenges along the way.
    - The leave-no-trace pack will be used to pick up the items used during the challenge to ensure we don't leave them in the canyon.
  - **BE SURE ALL TEAMS HAVE COMPLETED THE ABOVE ACTIONS BEFORE READING THE 1ST CLUE.**
- (Team Lead read Clue #1 from Ocean Discovery Leadership Challenge: Clues & Challenges Card.)
- (When a challenge is completed, facilitate the Share-Out.)
  - (Have students and adults gather into a circle for Share-Out.)
  - (Share-Out question can be found on Ocean Discovery Leadership Challenge: Clues & Challenges Card.)
- (Once the Share Out is complete have students put supplies into the Leave No Trace backpack.)
- (Team Lead reads the next clue from the Ocean Discovery Leadership Challenge: Clues & Challenges Card.)
- (Continue this process until you are back at the lab.)
  - If you are the first team back, say Go Awesome! Congrats, you won!
    - (Hand out stickers to your team.)
- (Return to Science Lab meeting space.)

Wrap Up (15 min)

- Debrief the experience using a think-pair-share:
  - What is something you learned about someone on your team?
  - Who is someone on your team that you would like to call out for being a leader during the Ocean Discovery Leadership Challenge?
  - Where do you see yourself right now on the "Seed to Tree Pathway"?
- Share Ocean Discovery Leadership Challenge experience (when IPM tells you slide show is ready):
  - Do a slide show of the Clown Car + Marshmallow Challenge photos.
  - Declare a winner of the Marshmallow Challenge (tallest structure).
    - Provide a prize.
  - Declare a winner of Water Balloon Toss Challenge (group who had the final two people standing the furthest away).

Ocean Discovery Leadership Challenge: Clues & Challenges Card

	Clue	Challenge	Share Out
1	Read Clue #1 from your Science Lab meeting space: Clue #1 Travel in the direction water will flow. When you find a ribbon, you'll be good to go.	Marshmallow Challenge: Build the tallest free-standing structure in just 10 minutes using no more than 20 sticks of spaghetti, 5 pieces of tape, one yard of string, and one marshmallow. The structure has to stand firmly on its own; it cannot be propped up, held, or suspended from anything. Only one person can work on the structure at a time the rest are standing in a circle.	You just worked as a team to complete the Marshmallow Challenge. Describe how you contribute to a team.
2	Clue #2: Keep on walking, do not stop. Until you find something you played with as a tot.	Water Balloon Toss Challenge: Find a partner. Stand directly across from your partner with three feet of distance between you. One person must toss the water balloon to the other without breaking it. Those that are successful will take a step back and toss it back. You will continue until the last pair's water balloon breaks. Measure the distance of the group that goes the furthest. The team who has the furthest distance wins!	You just participated in the Water Balloon Toss Challenge where you needed to work with a partner to be successful. All leaders need partners to support them. Share about someone who has supported you in your life. Who is that person and how have they helped you?

3	<u>Clue #3</u> Continue the same way, Give it all you've got! When you find a box with your team color, you've found the spot.	Nothing in Common Challenge: Break your team into three groups. Each group will take a bag out of the box. Work as a group to organize the objects in your bag into a minimum of three categories. Rules: Each category must have at least two items. All items must be assigned to a category.	You just completed the Nothing in Common Challenge where you were all given the same items, but each group found a different way to categorize them into groups. This is called diversity of thinking (different ways of thinking about a similar problem). Do you think it is important for science leaders to be diverse (look different, come from different places, have different backgrounds, etc.)? Why or why not?
4	<u>Clue #4</u> Go back to the lab and Find the golden Odi. This fish is excited about the science leader it knows you will be!	Leadership Challenge: Using only your bodies you must spell out the word "LEADERSHIP" and have your instructor take a picture.	What is one quality or characteristic you think is important in a leader?

Ocean Discovery Leadership Challenge – Map of Challenges

Challenge #1 – Marshmallow Tower

Build the tallest free-standing structure in just 10 minutes using no more than 20 sticks of spaghetti, 5 pieces of tape, one yard of string, and one marshmallow.

The structure has to stand firmly on its own; it cannot be propped up, held, or suspended from anything.

One person at a time can work on the structure! Everyone else in a circle around it. Rise you hand if you have an idea and want to work on the tower.

When 10 minutes is up – you must figure out a way to prove how tall your tower is and take a picture.

Challenge #2 – Water Balloon Toss Challenge

Find a partner. Stand directly across from your partner with three feet of distance between you.

One partner must toss the water balloon to the other without breaking it. Those that are successful will take a step back and toss it back to the other partner.

You will continue until the last pair's water balloon breaks. Measure the distance of the group that goes the furthest. The team who has the furthest distance wins. Just like the challenge before you must measure your furthest distance!

Be sure to pick up all the pieces of the broken water balloons and any other small trash you find. Place trash in the canvas tote bag to be thrown out back at the lab. 1st rule of Leave No Trace -Always leave a place better than you found it!

Challenge #3 – Nothing In Common

Break your team into three groups.
Each group will take a bag out of the box.
Each group will organize the objects in the bag
into a minimum of three categories.
Each category must have at least two items.
All items must fit into a category.

Challenge #4 – Leadership

Using only your bodies you must spell out
the word “LEADERSHIP” and have your instructor take a picture.

Scientist Avatar: (40 min)

Goal: Students build belief that they are unique science leader contributing to a community of scientists through the creation of their own scientist persona.

Intro: (5 min)

- Introduce Scientist Avatar:
  - On the pathway to becoming a science and conservation leader.
  - Today you will create a Scientist Avatar of yourself.
  - Define avatar: an electronic image representing someone- in this case- You!
  - Important to envision yourself as a scientist and an avatar can help you do that. You will be creating an electronic image of yourself as a scientist.
  - You will have time to build a few avatars who have different careers.
  - At the end you will choose your favorite and we will print it out as a sticker for you.
  - It's okay if you like more than one avatar or aren't sure what kind of scientist you might want to be when you are older this is just a chance to start envisioning yourself as a scientist in the future.
- Demonstrate how to use the program by quickly creating an avatar. Explain:
  - Some features are optional meaning you can leave them off your avatar (nose, glasses, etc.)
  - You can have your avatar try on different careers – it's okay if you like the background but don't like or understand the name of the profession on the picture. It's more about which background you like. Don't worry about what the career says.
- You will have 15 minutes to try build different avatars of yourself before you will choose one for us to print out.
- Questions?

Activity: (15 min)

- Have students open laptops (they should already be on the website) and release students to work.
- Give students a 5-minute warning. Remind them in 2 minutes they will have to decide on a final avatar to print.
- Give students a 3-minute warning. Design your final avatar.

Debrief: (10 min)

- Debrief the experience using pair-shares. Potential questions include:
  - Describe the avatar you created to represent you as a scientist. What about this avatar represents a possible future you?
  - What kind of things might you want to investigate/study as a scientist?
  - What do you think could be challenging about being a scientist?

Sending Avatar: (10 min)

- Project and review directions for sending avatar to be printed.
  - (Review Science Avatar slide on OL Bridge PowerPoint.)
  - Papi:/LI New/8th Grade OL Bridge/**8th Grade OL Bridge PPT**

Team Name (15 min)
Goal: Students build belief that they are unique science leader contributing to a community of scientists through the creation of a team name.

Intro (2 min):
- Introduce Team Name:
  - We are each unique scientists – scientist avatar, we are also a community of scientists working together.
  - Rather than assign a team name- we will work to come up with our own name.
  - Only rule is the team name needs to be related to science (scientists, plants or animals, the environment, etc.)

Activity (10 min):
- Do a think-pair-share for: What should our team name be?
  - (Write suggestions on the board.)
  - (Have the team vote or negotiate for team name.)
- ****As soon as the team name has been decided on – text it ASAP to IPM so it can be added to scientist avatar stickers.**

Debrief (3 min):
- Team name will be used sometimes to get the group's attention when Team Lead has information/instructions.
- Team name can also be used to celebrate team achievements, to get pumped up/excited, or to encourage a team member who is feeling challenged.
- (Have students practice shouting the team name as a celebration of completing Day 1 together.)

Science Notebooks (20 min):

Intro (5 min)
Teaching note: At some point the IPM should drop off scientist avatar stickers.

- Introduce science notebooks. Be sure to cover:
  - Scientists need a place to take notes, write down observations/questions and make sketches and drawings about the things they see in the natural world.
  - Provide you with a science notebook that you will use every day of the program.
  - Will stay at the Living Lab during the program but it will be yours to take home at the end of the program.
  - Point out Ocean Leader quotes.
  - There are many blank pages for you to write/draw whatever you want.
    - (Show students these pages.)

Activity (13 min)
- Have students write their names on: Who this Notebook belongs to page
- Allow student to decorate inside cover.
  - Students can add their scientist avatar sticker and Ocean Discover stickers to their notebook if they want.

Debrief (2 min):
- Show students where these notebooks live in your meeting space.
- Explain that starting tomorrow it will be their responsibility to have their science notebook in their hand when Science Labs start.
- (Collect science notebooks.)

Science Labs

Day 2

Goals: Students are engaged in exciting science programming that prepares them to use the Science Discovery Process, learn about their new home (the Living Lab), and create expectations around their mentor/mentee relationship.

Timing:

Time	Activity	Schedule	Round Robin
45 minutes	Community Building	9:00 – 9:45AM	n/a
45 minutes	Living Lab Scavenger Hunt	9:45 – 10:30AM	*These two activities will be done round robin style – so you MUST start and end on time and transition to the new activity in the time allotted.*
5 minutes	Transition	10:30 – 10:35AM	
45 minutes	Living Lab Tour	10:35 – 11:20AM	
5 minutes	Transition	11:20 – 11:25AM	
50 minutes	Mentee Training	11:25 – 12:15PM	n/a
15 minutes	Chores	12:15 – 12:30PM	n/a
30 minutes	Lunch	12:30 – 1:00PM	n/a
60 minutes	PEN Program	1:00 – 2:00PM	n/a

Supplies:

- Large whiteboard + whiteboard stand (1)
- Dry erase markers black (2)
- Dry erase markers different colors (20)
- Laminated "Mentor – My Pathway Questions" paper (2)
- Laminated "Living Lab Scavenger Hunt" card (4)
- Laminated "Living Roof" card (1)
- Sharpies (4)
- Stopwatch (4)
- Speed Dating Question Cards (1/student)

Visuals:

- Word Wall
- Community Agreements poster + stand
- Load Living Lab Tour visuals onto all SMART boards in Science Labs
  - Coordinate the PowerPoint Anne and Dan will be using with Anne

Intensive Program Manager

- Talk to scientist mentors so that they understand what their role during the Orientation Scavenger Hunt will be, as well as the location where they will be "hiding" - Watershed Plaza
    - Explain that each mentor will not be with their group for the first two activities of the day.
    - They will be the mentor on the scavenger hunt for the other group.
    - They will join the other science group for the Living Lab tour.
- Walk around and remind staff who are participating in Mentor Training Speed Dating Activity and let them know which science lab meeting place to report to.
- Help mentors get where they are going throughout the morning.

Set Up

- Set up for <u>Orientation Scavenger Hunt</u>:
    - In the Ocean Alcove have the giant screen say:
        - "Welcome to the David C. Copley Ocean Alcove Ocean Leaders! This is a great place to hang out, do homework, and study during the school year!"
    - In the Cox Innovation Alcove:
        - Write on the white board – "Sign your name on the whiteboard using whatever color and whatever style of writing you would like."
        - Write in the center of the whiteboard: "Future Science Leaders!"
        - Place dry erase markers in multiple colors near whiteboard.
    - In the Watershed Plaza:
        - Set up a whiteboard + stand and write the following questions on the board:
            - Where did you go to college and why did you choose that school?
            - How did you know you were interested in being a scientist?
            - What is an obstacle you have faced in your job and how did you overcome that?
            - What subject was difficult for you in school and how did you overcome that?
            - What company do you work for now and what do you enjoy most about it?
            - Who is someone who helped you on your pathway to becoming a scientist?
            - What is something you did when you were younger that made you interested in science?
            - What was a job/internship/volunteer experience you did that you realized wasn't a fit for you and how did that shape or change your pathway?
    - In the Walter J. and Betty C. Zable Discovery Gallery set up the Community Agreements poster.
    - On the Living Roof:
        - Place the "Living Roof" card on a bench and place a rock on top so card does not blow away.

Teaching Notes for Team Lead

- Today's first two activities are round -robin style meaning everyone will be relying on each other to adhere strictly to timing.
- During the Orientation Scavenger Hunt Debrief:
  - Keep students socially distanced.
- During Living Lab Tour:
  - Keep students socially distanced.
- During Chores & Announcements remind students what they need to bring for field trip tomorrow:
  - Hats
  - Sleeves
  - Water bottle
  - Sunglasses
  - Closed-toed shoes

Mentors

- Be sure there is at least one adult monitoring each table.
- Spread out amongst the students during all activities.
- Participate in all activities.
- During the Orientation Scavenger Hunt Activity (alumni mentors):
  - There will be one adult per group.
  - Count the number of students as you complete the scavenger hunt.
  - Encourage students to take their time at each station and to fully engage in the activity.
  - Remind students that it is not a race and there is plenty of time for each activity.
- During the Orientation Scavenger Hunt Activity: (scientist mentors):
  - The goal is to share your pathway with students. They can ask their own questions but questions that will be options for them include.
    - Where did you go to college and why did you choose that school?
    - How did you know you were interested in being a scientist?
    - What is an obstacle you have faced in your job and how did you overcome that?
    - What subject was difficult for you in school and how did you overcome that?
    - What company do you work for now and what do you enjoy most about it?
    - Who is someone who helped you on your pathway to becoming a scientist?
    - What is something you did when you were younger that made you interested in science?
    - What was a job/internship/volunteer experience you did that you realized wasn't a fit for you and how did that shape or change your pathway?

Living Lab Scavenger Hunt (45 min)

Goal: Students become more familiar with the Living Lab and the cultural norms of the program they will be expected to adhere to.

Intro: (5 min)

- Scavenger Hunt to orient you to your Ocean Discovery home- the Living Lab.
- Ocean Leaders are a special group of science leaders and there are many people and items in the Living Lab who will support you on your journey.
- Review rules of Scavenger Hunt:
    - (Review Living Lab Scavenger Hunt slide on OL Bridge PowerPoint.)
    - We will break into two teams – one with Team Lead and one with Alumni Mentor.
    - Each team will be given a Living Lab Scavenger Hunt Card and a sharpie.
    - Complete as many tasks as possible in whatever order you choose.
    - Everything you need to complete your tasks can be found inside of the Living Lab.
    - Make sure you are walking from place to place.
    - When you finish all your tasks return here.
    - You will have 25 minutes to work.
- Questions?
- (Divide students in half – assign one group to Alumni Mentor.)
- (Pass out Living Lab Scavenger Hunt cards and a sharpie – 1/group)
- (Give each group a stopwatch)
- (Have all students start stopwatch- remind them to return after 25 minutes).

Activity (25 minutes)

- Give students 25 minutes to complete the scavenger hunt.
- Give students a 5-minute warning over the intercom when there are 5 minutes remaining.

Debrief (15 min)

- Review each question of the scavenger hunt calling on different students to contribute.
- Be sure to cover:
    - Community Agreements
    - All answers related to program norms (times, what to do if you are late, cell phones on silent, etc.)
- While reviewing cell phone policy have all students take out phones and enter important phone number contacts.
    - Isabel

Living Lab Scavenger Hunt
Answer Key

Task	Complete (x)
Find the **location where your Science Notebooks** will be stored at the end of every day. Use your Science Notebooks to fill in the following information: • What time do you need to be at the Living Lab each morning: _____8:45AM_____ • What is the one item you must be wearing when you arrive at the Living Lab: _your polo____ • What are the two items you must bring with you EVERYDAY ○ _____ Water bottle, hat_____ • Who MUST you call if you are going to be late or miss a program day: _____Isabel_____	
Locate the **Grimes Family Achievement Alcove** – look around at all the pennants from the many different colleges Ocean Leaders have attended. Someday you will follow in their footsteps! Write down three college pennants you see. • _____Answers will vary_____ • _____Answers will vary_____ • _____Answers will vary_____	
Find the **David C. Copely Ocean Alcove** • What's one thing you can do in the Ocean Alcove during the school year? Welcome to the David C. Copley Ocean Alcove Ocean Leaders! This is a great place to hang out, do homework, and study during the school year!	
Locate the **Cox Innovation Alcove** • Complete the task on the whiteboard – Write your name on the board.	
Find a **mentor who is not part of your teaching group** and interview this person. Each person in your group must ask AT LEAST one question. You may ask more than one question.	
Find the **Living Roof** and then find the card with a picture of Odi the Ocean Discovery mascot. • What is Odi's one request when you arrive for Bridge program? ___ Phones are on silent and put away when you enter the building _____	
Locate the **Scientist in Residence.** This is a place where scientists from around the world stay when they come here to work with science leaders like yourself. • What kind of scientist would you most like to meet (you can have more than one answer). _____Answers will vary_____	
Locate a **photograph of Shara Fisler** and a former **President of the United Stat**es. • What President is Shara shaking hands with? ___President Barack Obama_____	

Locate the **Walter J. and Betty C. Zable Discovery Gallery.** Somewhere in this space is a poster titled "Community Agreements." As science leaders working together, this is a list of norms we all agree to adhere to. Read each one and discuss with your group what each agreement means to you. • No answer here	
From the **Walter J. and Betty C. Zable Discovery Gallery** walk down the hallway toward the main part of the lab - this is called the Leadership Pathway. Along the walls are quotes written by Ocean Leaders like yourself. Write down your group's favorite quote. • Answers will vary	
Find the **Supporter Wall in the Atrium** which lists the hundreds of people who are here to support you on your journey to becoming science leaders. Write down the names of two supporters on the wall. • Answers will vary	
Locate xx. Look on the walls – these are scientific publications that Ocean Leaders like you, have been a part of. Locate a paper by xx. Marlem is an Ocean Leader and you will have a chance to talk with her this week. • What is the title of the paper Marlem was a part of? • _____	

Living Lab Scavenger Hunt

Task	Complete (x)
Find the **location where your Science Notebooks** will be stored at the end of every day. Use your Science Notebooks to fill in the following information: • What time do you need to be at the Living Lab each morning: _____ • What item must you be wearing when you arrive at the Living Lab: _____ • What TWO items must you bring EVERYDAY: _____ • Who MUST you call if you are going to be late or miss a program day: _____	
Locate the **Grimes Family Achievement Alcove** – look around at all the pennants from the many different colleges Ocean Leaders have attended. Someday you will follow in their footsteps! Write down three college pennants you see. • _____ • _____ • _____	
Find the **David C. Copely Ocean Alcove**. • What's one thing you can do in the Ocean Alcove during the school year? _____	
Find the **Cox Innovation Alcove** • Complete the task on the whiteboard.	
Find a **mentor who is not part of your teaching group** and interview this person. Each person in your group must ask AT LEAST one question. You may ask more than one question.	
Find the **Living Roof** and find the card with a picture of Odi the Ocean Discovery mascot. • What is Odi's one request when you arrive for Bridge program? _____	
Locate the **Scientist in Residence.** This is a place where scientists from around the world stay when they come here to work with science leaders like yourself. • What kind of scientist would you most like to meet (you can have more than one answer). _____	
Locate a **photograph of Shara Fisler** and a former **President of the United States**. • What President is Shara shaking hands with? _____	

Task	Complete (x)
Locate the **Walter J. and Betty C. Zable Discovery Gallery.** Somewhere in this space is a poster titled "Community Agreements." As science leaders working together, this is a list of norms we all agree to adhere to. Read each one and discuss with your group what each agreement means to you.	
From the **Walter J. and Betty C. Zable Discovery Gallery** walk down the hallway toward the main part of the lab - this is called the Leadership Pathway. Along the walls are quotes written by Ocean Leaders like yourself. Write down your group's favorite quote. •	
Find the **Supporter Wall in the Atrium** which lists some of the hundreds of people who are here to support you on your journey to becoming science leaders. Write down the names of two supporters on the wall. • _____ • _____	
Locate **xx**. Look on the walls – these are scientific publications that Ocean Leaders like you, have been a part of. Locate a paper by xx. Marlem is an Ocean Leader and you will have a chance to talk with her later this week. • What is the title of the paper Marlem was a part of? _____	

Living Lab Tour (45 min)

Goal: Students become more familiar with the Living Lab and its sustainable design and begin to feel as if the space belongs to them.

Intro: (15 min)

- Anne and Dan to share their pathway stories.
- Share a 5-10 minute slideshow on how the Living Lab was developed.

Tour (30 min)

- Dan can focus on building sustainability & architecture.
- Anne focus on student usage.
    - Mention places that can be used during "study hall" later in the program.
        - Kitchen, Achievement Alcove, SciTech Lab, Ecolab, Innovation Alcove, Ocean Alcove

Mentee Training (50 min)

Goal: Students learn what a mentor-mentee relationship is and learn how to make the most of this relationship with Ocean Leader Bridge Mentors.

Intro: (15 min)

- (Use Mentee Training slides in Ocean Leader Bridge PowerPoint.)
- What is a mentor?
    - Have students brainstorm ideas about what a mentor is and what they do.
    - (Write some responses on the board.)
    - A key part of being an **Ocean Leader** includes having mentors –older Ocean Leaders, Ocean Discovery staff, or scientists who can offer advice, share their experiences, and help you understand things that are confusing to you.
    - Mentors are amazing people who volunteer their time and BELIEVE in you and your ability to become a future science leader!
    - During Ocean Leader Bridge our group will always have a scientist mentor – a person who currently works in a science field and an alumni mentor – a person who is an Ocean Leader and participated in Ocean Leader programs.
    - (Remind students who the mentors in their group are, calling out which type of mentor they are.)
- How do I utilize my mentor?
    - Easy! Ask them questions!
        - Scientist mentors:
            - Ask them about how they go to the place they are today?
            - What do you like about your job?
            - What was one challenge you faced on your pathway to becoming a scientist?
        - Alumni mentors:
            - What is your favorite part about being an Ocean Leader?
            - Which program was your favorite? Why?
            - What is BAHIA like?
    - Ask any questions you want!

- Ocean Leader Bridge Mentors:
    - Can also help you with any material you don't understand during the program. If you don't understand something – ask them! They want to help you!
    - They will be in charge of Office Hours- an opportunity to get clarification about what you are learning. You don't have to wait until Office Hours to ask questions- ask anytime!
    - Remember each Bridge Mentor will only be here for three mornings- so take advantage! Ask lots of questions. Get to know them!
- Mentor-Mentee Relationships
    - Discuss boundaries:
        - It is important to remember that any mentor-mentee relationship should be comfortable.
        - If you are ever not comfortable with the way you are being talked to or the situation you are in with a mentor you should remove yourself immediately and report what occurred to a trusted adult (family member, other Ocean Discovery staff member, etc.)
    - Discuss equity and inclusion:
        - Be aware of assumptions you might make based on differences.
            - Mentors and mentees come in all shapes and sizes.
            - Seek out opportunities to interact with others from different backgrounds – that is how you learn new things.
            - Treat everyone—regardless of race, sex, or status—with respect, consideration and politeness.

<u>Speed Dating Activity</u>: (30 min)

- Today we will get a chance to get to know a mentor by asking lots of questions through a "speed-dating" style activity.
- Describe how speed-dating works.
- Today you will get to "speed date" several mentors. Since there are so many of us, we have invited some additional Ocean Leader mentors to join us! There are many people who work for Ocean Discovery Institute who can act as mentors to you. Over the years you will get to know these people better.
- (Ask each Ocean Discovery staff member to introduce themselves.)
- Explain activity:
    - Mentors will introduce themselves and say if they are a scientist mentor, alumni mentor, Ocean Discovery staff mentor or any combination of the above.
    - Mentees will introduce themselves.
    - Mentee's will have three minutes to get to know each mentor.
        - You may not have time to visit with everyone.
        - Take turns asking your mentor questions. If you need help you will be given a list of questions, but you can ask any questions you want.
    - When the Team Lead yells "Switch!" mentees will get up and move to the next mentor in line and have another three minutes.
    - Questions?
- (Hand out "Speed Dating Question Cards" to each student.)
- (Set up staff and students in seats facing each other.)
- (Set the timer for three minutes.)
- (Team Lead will let students know when to switch.)

Debrief (5 min)

- Bring the group together and debrief. Potential questions include:
    - What is something you learned about a mentor today?
    - What is something you had in common with a mentor?
    - How do you think you can utilize mentors over the next ten days?
    - What is one question you want to ask the next group of mentors who will arrive on Thursday?
    - Do you think you can be a mentor to someone?
    - Is it possible to be a mentor and a mentee at the same time?

Science Labs

Day 3

Goals: Students are engaged in exciting science programming that focuses on understanding what an invertebrate is.

Timing:

Time	Activity	Schedule
35 minutes	Community Building	9:00 – 9:35AM
35 minutes	Drive to Rocky Seashore	9:35 – 10:10AM
95 minutes	Rocky Seashore Exploration	10:10 – 11:45AM
15 minutes	Thank-you's	11:45 – 12:00PM
25 minutes	Lunch	12:00 – 12:25PM
35 minutes	Drive to Living Lab	12:25 – 1:00PM
60 minutes	PEN Program	1:00 – 2:00PM

Supplies:

- Student science notebooks
- Instructor Backpack (1/instructor)
    - Small white board
    - White board erasers/rag
    - Binoculars
    - Dry erase markers (3)
    - Extra pens (10)
    - Portable 1st Aid Kits (1/instructor)
- Explorer Backpack (1/ student)
    - Binoculars
    - Hand lens
    - Pens
    - Rocky Seashore Animal ID Card (laminated)
    - Map to LaJolla (laminated)
    - Trowel
- Tide chart
    - Printed each week from: https://tidesandcurrents.noaa.gov/noaatidepredictions.html?id=9410230
- Mentor thank you gifts (6)
- Digital camera (1)

Visuals:

- Word Wall

Intensive Program Manager

- Exchange phone numbers with all Team Leads and mentors before field trip.
- Make sure all drivers have directions to drop-off location/parking area.
- Upon arrival at the Rocky Seashore determine which part of the tidepools each group will explore and which part of the sandy beach each group will explore.
- Bring digital camera for Thank You photo.
- Bring Mentor Thank You gifts.

Set Up

- Check that tide charts (see above-Supplies) in explorer backpacks include today's date.

Teaching Notes for Team Lead

- When sitting down for Rocky Seashore Exploration Intro have students sit facing away from ocean.
- During Rocky Seashore Exploration
  - Make sure students stay within the physical boundaries when exploring the rocky seashore.
  - Watch out for students too close to the waves.
  - Count students often.
  - Make sure students stay socially distanced.
  - Slow down students who are running and jumping. Walk around with these students for a while.

Mentors

- Help to make sure students stay within the physical boundaries when exploring the rocky seashore.
- During Rocky Seashore Exploration you have a **Mentoring opportunity.**
  - What have you found?
  - Do you think it is difficult for that animals to survive here? Why or why not?
  - Do you think the same animals live up in these tidepools that live in the tidepools close to where the waves are breaking? Why or why not?
  - Do you have any questions about this animal?
  - Do you have an idea about what the definition of an invertebrate might be?
  - Do you think this animal is an invertebrate? Why or why not?

Drive to Rocky Seashore at La Jolla (35 min)* *Includes 10 minutes of time for parking and unloading.*

Leaving Living Lab:

- Have each student grab their science notebook and utilize the bathroom.

Directions:

- Take Fairmount Avenue to **805 N**
- Take the exit for **La Jolla Parkway** (CA-52 W)
- La Jolla Parkway will become **Torrey Pines Rd**.
- Make right onto **Prospect Place**.
- Make a right onto **Jenner Street**.
- Make a quick left onto **Coast Blvd S**.
- Coast Blvd S. becomes **Coast Blvd**.
- Continue heading south on **Coast Blvd.** while looking for parking.

Parking & Gathering:

- When you are on **Coast Blvd**. immediately start looking for parking along the coast.
- Park at the first opportunity.
- Have all staff and students gather at the Gathering Place (or a grassy area as close to it as possible).
- Hand each student an explorer backpack as they get off the bus.
- Have all groups disperse along the grassy area above the tidepools to start their science labs.

Rocky Seashore Exploration (90 min)
Goal: Students explore the rocky seashore and the organisms that live there while defining what an invertebrate is.

Intro: (20 min)

- Welcome students to the La Jolla coast.
    - Ask if anyone has ever visited here before? What did they do while they were here?
    - (Orient students to their location in relation to City Heights using laminated map.)
    - Today we are here as scientists to explore the rocky seashore.
- Introduce the concept of what scientists do and how they use the Science Discovery Process. Scientists:
    - Explore and Wonder*: Scientists are always exploring the world around them and wondering how it works. Scientists ask lots of questions.*
        - **Movement**: Crossed arms/rub your chin/ make a questioning face.
    - Investigate*: Scientists make many observations and collect information when exploring. They do this using all of their senses like seeing, hearing, touching, tasting and smelling.*
        - **Movement**: Hands up to eyes like binoculars & look side to side
    - Analyze*: Once scientists make observations and collect date they look for patterns and try to come up with explanations for their questions.*
        - **Movement**: Typing on keyboard
    - Communicate*: Scientists know it is really important to share the things they learn with other people so they share their work and ideas.*
        - **Movement**: Turn to your left and give an air high-five (without touching), continue air high-fiving around the circle until the high-five returns to the first person. (This can be done in the future with smaller groups.)
    - Make a Difference*: Scientists work to make the world a better place with the things they learn.*
        - **Movement**: Stand like a superhero with legs apart and hands-on hips
- Introduce Explorer Backpacks. Be sure to include:
    - Today is a day for exploring!
    - When exploring it can be good to have tools.
        - Science notebook to write down observations and questions.
        - Explorer backpack with scientific equipment.
    - Give students a moment to look through their explorer backpacks to see what types of tools they have to explore for the day.
        - Quickly review tools and how they can be used.
        - Remind students of community agreements – want to take care of equipment.
    - Keep out science notebook, pen, and the laminated map and put all other tools away.
- Introduce the rocky seashore. Be sure to include:
    - There are many ecosystems here in La Jolla including: the ocean, sandy beaches, rocky beaches, etc. – to start we will be making observations about the rocky seashore.
        - (Point at rocky seashore.)
        - Ask students what they already know about the rocky seashore.
        - Ask students to try to define rocky seashore.
            - Rocky seashore: a coastal seashore made of solid rock.
    - A defining feature of the rocky seashore is tidepools.
        - (Point to the tidepools.)
        - Ask students to try and define tidepool.
            - Tidepool: Pools of saltwater that are left behind when the tide goes out.

    - Two high and two low tides in San Diego each day.
    - Have students make a hypothesis: Is it high or low tide?
        - Ask students to back up their hypothesis with evidence.
            - Students may use tide charts or observations about the level of water, seaweed lines, etc.
        - Have students confirm their answer using tide charts.
            - If time allows ask some follow up questions: When will the next high tide be? Next low tide? What day will we have the lowest low tide? Etc.
- Introduce goal for this science lab.
    - Explore and wonder about the animals that live at the rocky seashore and define what an "invertebrate" is.
        - You may already know that this word means- or you may not. Either is fine.
    - Lots of invertebrates make their home at the rocky seashore.
    - Find three organisms that you believe are invertebrates and in your science notebook- make a detailed sketch of each organism.
        - Detailed sketches take 3-5 minutes to draw.
        - You look closely at the organism and sketch the details.
        - Figure out the name of your organism.
    - Have students turn to Page 7 in their science notebooks.
        - This is where you drawings should go.
- Share expectations for rocky seashore exploration: Be sure to include:
    - Use any tools you have into your backpack to explore.
    - Stay within the set boundaries. The boundaries will be defined when we walk down to the rocky seashore.
    - Move slowly- the rocky seashore is slippery. Walking only.
    - Stay three feet from other people.
    - Stay back from the waves.
    - Be respectful of animals.
        - Use one VERY gentle finger to touch things.
        - Do not "poke" or push forcefully on anything.
        - If you want to pick something up and it doesn't come up easily – leave it there and study it where it is. Don't try to pry or rip things off of rocks.
    - Questions?
- Have student place all supplies into their explorer backpack.
- Lead students down to rocky seashore.

<u>Walk down to Tidepools:</u> (5 min)

<u>Activity</u>: (45 min)

- Once you reach your area for exploration gather students around in a circle and show them the physical boundaries they may explore.
    - (*Include a distinct boundary that keeps students back from the waves*).
- Release students to explore.
- Adults should walk around and interact with students.
- (Give students a 5-minute and 2-minute warning.)

<u>Walk up to Debrief Area</u>: (5 min)

<u>Debrief:</u> (15 min)

- Take time to have students and adults sit comfortably in a socially distanced half-circle facing away from the ocean.
- Have students take out:
    - Rocky Seashore Animal ID Card
    - Science notebook
    - Pen/pencil
- Review goal of exploration: *Explore and wonder about the animals that live at the rocky seashore and define what an "invertebrate" is*. Have students share observations from exploration. Possible questions include:
    - Was anyone able to identify/name an animal they saw?
        - (Write the name of the organism on the whiteboard.)
        - Follow up: Who else saw (name the organism)?
        - Repeat until you get a list of 6-7 organisms.
        - (Have students copy this list of invertebrates into their science notebook on Page 8.)
        - (Tell students they are welcome to add any additional organism they saw to their list.)
    - Great job! Looks like we found lots of different organisms today!
        - One thing I can tell you about this list of organisms is that they are all invertebrates! (If there is something that isn't cross it off the list, "Everything on this list but xx is an invertebrate.)
    - Ask students to try and define invertebrate.
        - Invertebrate: An animal without a backbone.
        - Ask students if they are invertebrates? How do you know?
        - (Have students write the definition of invertebrate into their science notebook on Page 8.)
    - We found lots of invertebrates here in La Jolla.
        - Do you think there are any invertebrates back in City Heights? Why or why not?
        - Do you think some invertebrates live on land?
            - What might be some examples?
- Great job exploring today scientists!
- (Make sure each student returns all tools to backpacks.)
- (Make sure each student has their backpack.)

Thank You (15 min):

- (Gather all cohorts together.)
- (Team Lead pull aside students who are doing thank-you's and check in with them quickly and give them their mentor gift.)
- (Assistant Lead have all other students sit in a semi-circle with backs to the ocean.)
- (Have all mentors line-up facing sitting students.)
- (PIM or Team Lead choose a student to do the first thank you. Have them walk up and stand next to the mentor they are thanking but face the group to give their thank you & gift so that everyone can hear.)
- (Repeat the above until all mentors have been thanked.)
- (IPM – take a group picture.)
- (Have all students stand up and create a high-five tunnel for the mentors to walk through.)
- (When all mentors have cleared the tunnel have students grab their backpacks and walk back to the bus.)

Lunch (25 min):

- (Lunch will be eaten on the grass.)
- Review expectations of eating outside.
    - All trash in trash bags.
    - Leave things better than you found them.
    - If you don't want it, offer it to someone else.
    - All food eaten here- no food in vans.

Science Labs

Day 4

Goals: Students are engaged in exciting science programming that focuses on understanding how invertebrates are adapted to live in their environment.

Timing:

Time	Activity	Schedule
45 minutes	Community Building	9:00 – 9:45AM
30 minutes	Invertebrate Lecture & Concept Map #1	9:45 – 10:15AM
90 minutes	Invertebrate Adaptation Lab	10:15 – 11:45AM
30 minutes	Office Hours #1	11:45 – 12:15PM
15 minutes	Chores & Announcements	12:15 – 12:30PM
30 minutes	Lunch	12:30 – 1:00PM
60 minutes	PEN Program	1:00 – 2:00PM

Supplies:

- White board + stand (1/group)
- Whiteboard markers (2/group)
- Dry erase board eraser (1/group)
- Laptop (1/student)
- Live Invertebrates (1 per 2 students)
    - Each student should have the chance to interact with two animals. There can be multiples of a species, no one species should make up more than 50% of the organisms and greater diversity overall is optimal.
    - Best invertebrates for this lesson: Giant Keyhole Limpets, Ochre Sea Star, Chiton, Snails (the larger the better)
    - Invertebrates not to use for this lesson: Hermit crabs
- Small aquaria w/ lids (1 per 2 students)
- Dry rags (2/group)
- Dry towels (2/group)
- Large plastic bin (1/group)
- Bucket of clay (1/group)
- Laminated “Survivor” sign (1/group)
- Laminated “Non-survivor” sign (1/group)
- Acrylic panel (1/group)
- Large sieve (1/group)
- Home depot bucket (2/group)

Visuals:

- KNOW and OWN Knowledge Mantra poster

Intensive Program Manager

- Greet and orient new mentors.
- Introduce new mentors at Community Building during Announcements
- Assign all Mentors to "Office Hours" locations.
- Review the concept of "Office Hours" with mentors – they will have a group of 3-4 students they will be working with individually (see green box below).
- Return living invertebrates to tanks during Science Labs.
- Collect dirty towels and rags after Science Labs and put in laundry.
- Put laundry in dryer during Office Hours.
- Fold laundry after lunch.
- Reach out to SIO to confirm next day's Invertebrate Conservation Lab – will be outdoors.

Set Up

- For Concept Map and Lecture activity:
  - Set up a whiteboard and stand near the SMART board.
  - Hang up the KNOW and OWN Knowledge Mantra Poster
- For Invertebrate Adaptations Lab:
  - Ensure there are diverse invertebrates and enough for each pair of students to have one.
    - Place each invertebrate in a small aquarium and place a lid on top.
  - Place all aquaria back in the tank so that they stay chilled and aerated until they are needed for the lab.
  - Place acrylic panel at an angle inside the large plastic tub (to create a "rocky seashore").
  - Fill home depot buckets with water about 2/3 full.
  - Divide clay into equal pieces (about 1in balls) one per student + 2 additional/adult and place back in the clay bucket.
  - Wet two wash clothes and place off to the side with dry towels (for students to clean clay off hands).
  - Set up a spot where you can lay out both the "Survivor" and "Non-Survivor" laminated cards with enough space to lay survivor and non-survivor clay invertebrates out after experiment.
- For Office Hours:
  - Make sure all laptops are open to Google Document "Office Hours Sign Up – Day 4"

Teaching Notes for Team Lead

- During Invertebrate Lecture and Concept Map #1:
  - Remind students not to worry about copying concept map until instructed to do so.
- During Office Hours:
  - Watch Google Sign-Up sheet and remind students that there are a maximum of three people per Office Hours location.
- During Chores & Announcements remind students what they need to bring for field trip tomorrow:
  - Hats
  - Sleeves
  - Water bottle
  - Sunglasses
  - Closed-toed shoes

Mentors

- Be sure there is at least one adult monitoring each table.
- Spread out amongst the students during all activities.
- Participate in all activities.
- During Rocky Seashore Adaptations & Canyon Invertebrates activities you have a **Mentoring opportunity.**
    - Be sure to engage with students in your floor area by asking questions and providing guidance and positive reinforcement
        - What kind of adaptation do you think that invertebrate has?
        - How do you think that could help that animals to survive?
        - Do you think that is an invertebrate? Why or why not?
- During Office Hours:
    - You will have a group of 3-4 students for approximately 15 minutes.
    - Invite students to sit together at one table.
    - Welcome students to Office Hours.
    - Explain that this is a space for students to ask questions and clarify information.
    - Have a student share their question.
        - Remind students that their question(s) is written in their science notebook if they forgot.
        - When a student shares a question – do you best to answer it or have other students help to answer the question.
        - If it feels appropriate – have students add things to their concept map.
        - If you do not know the answer to a question, explain to students that you will not know the answer to every question but that you have resources such as the internet to find answers.
            - (Have students use laptops to research the answers – try to come to an answer as a group.)
    - During the last two minutes of office hours a musical cue will sound for everyone to return to their cohort.)
        - Be sure the space you are in is left exactly as you found it.
        - Take laptops back to original room.

Invertebrate Lecture & Concept Map #1: (30 min)

Goal: Students are introduced to the idea of how to take information from a lecture and organize it for understanding (KNOW) through building a concept map.

Intro: (10 min)

- Introduce the concept of Knowing and Owning information. Be sure to cover:
  - (Use KNOW and OWN Mantra poster.)
  - Knowing (KNOW) – learning information through the development of concept maps and asking questions to solidify understanding
  - Owning (OWN) – memorizing, discussing, applying and teaching others about the knowledge they KNOW.
- Introduce Learning Pyramid. Be sure to cover:
  - (Show slide of Learning Pyramid from Ocean Leader Bridge PowerPoint)
  - Learning pyramid shows the many ways in which people learn.
  - Retention rates – how much of the knowledge people are able to remember.
    - Low remembrance: reading, lecture, audio/visual (watching a video, etc.)
    - Higher remembrance: discussion (talking about information), practice (labs, experiment, building something, etc.) and teaching others.
  - In high school and college some classes will be in a lecture format.
    - (Show slide of college lecture hall.)
  - A lecture is an educational talk that usually includes visuals like a PowerPoint.
    - Lectures have low retention rates- meaning students do not remember much of what is taught in a lecture simply by being there.
  - Important to take information given in a lecture and use it one of the other ways that have higher retention rates so that students KNOW the information and can then OWN it.
  - Knowing how to learn and remember information from a lecture is an important skill for high school and college and one will we learn and practice during Bridge.
  - Today we will have a short lecture and then I will show you how to take the information in the lecture and organize it into something we can use to remember what was taught – that is the (KNOW) part.
  - Later today you will have your first Office Hours where you will continue to build on your information (KNOW) and start to work towards OWNing your knowledge.

Lecture: (5 min)

- Have students take out their science notebooks and turn to page xx.
- Explain that students should take notes during the lecture. Tell students there will only be one slide of notes today.
- (Give lecture.)
  - Invertebrates
    - Definition: an animal without a backbone
    - Examples: have student list examples they have seen
      - (Fill these in on whiteboard as students name them.)
  - Today's labs: How are invertebrates adapted to their environments?
  - Adaptation
    - Definition: something that helps an organism survive in its environment.

- Ex: Polar bear– ask students where polar bears live? The arctic. What is the Arctic like? How are polar bears adapted to survive there?
- (Fill these in on the whiteboard as students name them.)

Build a Concept Map (13 min)

- (Keep lecture slide up on the SMART board.)
- Introduce building a concept map. Be sure to cover:
  - Take the information that you wrote down during the lecture and organize it in a way that makes sense and helps us to KNOW the information.
  - One option is a concept map. Concept maps help you to make connections between the things you have learned.
  - Today, instructor will show you what this would look like for today's lecture.
- (Build a concept map on whiteboard while modeling your thinking – SEE BELOW EXAMPLE.)
  - (Students need to understand what goes on inside your mind as you build a concept map. See example above.)
  - **(Remember: do not ask students questions while building the concept map. You are simply trying to model what you would be thinking to take today's notes and turn them into a concept map.)**
  - **(Students should NOT copy concept map while you are working- explain that they will have time at the end.)**
- (Once concept map is complete have students copy it into their notebook.)
  - (Show students where to create concept map in their science notebook.)
  - (Remind students that we will be adding to this concept map so they should leave some space but not make the concept map too small.)

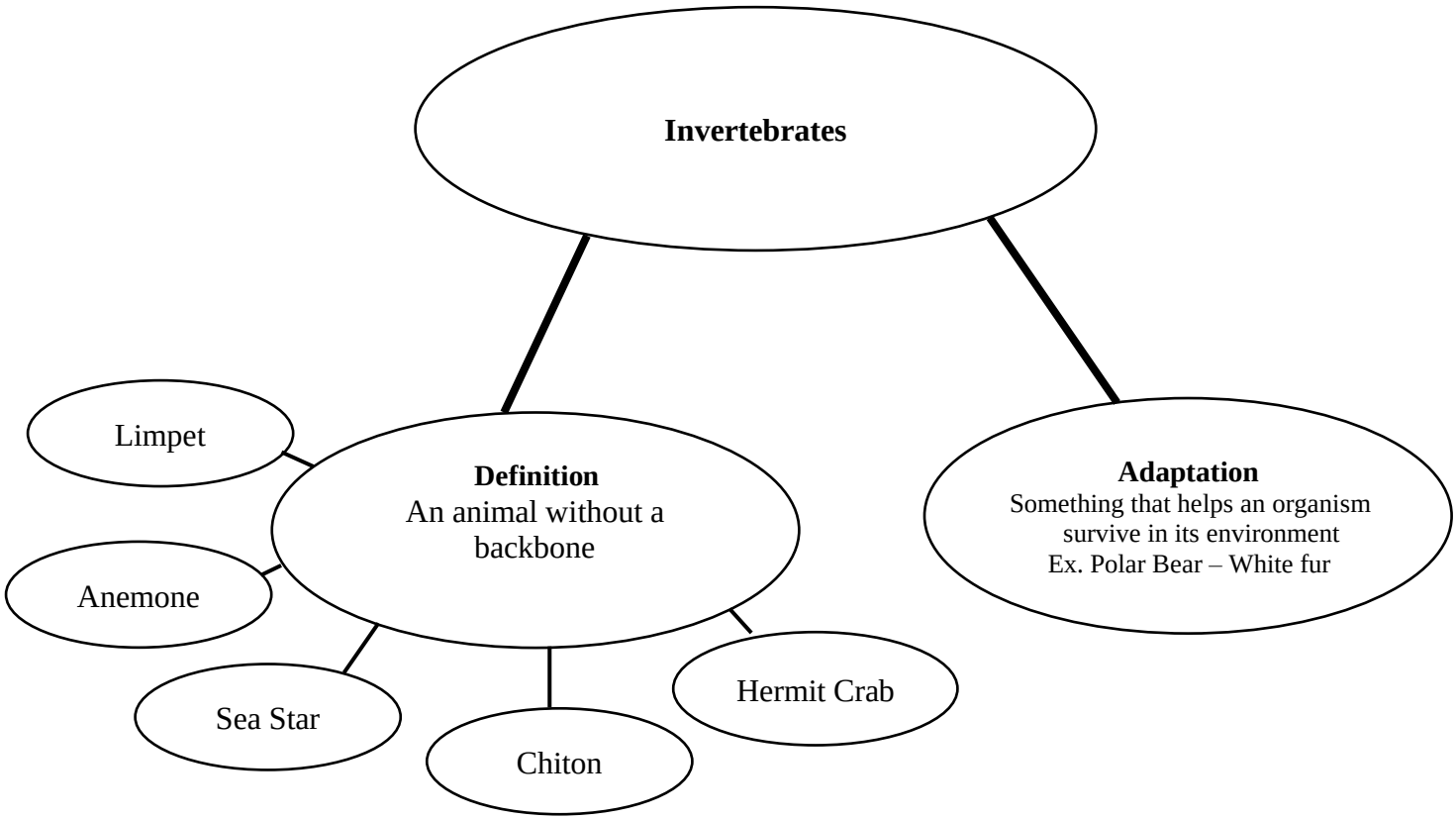
Debrief: (2 min)

- Preview Office Hours. Be sure to include:
  - This afternoon you will have your first Office Hours.
  - During office hours you will continue to work on your concept map (KNOW) and learn a study skill in order to take the information you have and begin to OWN it.
- Later this week you will have a chance to practice building your own concept map.

Concept Map & Mental Modeling for Lecture #1

Mental Modeling

- *I want to start my concept map by thinking deciding what was the main topic of the lecture. So, I am going to look at my notes (walk over to SMART board) and say to myself- what was today's lecture all about? – Invertebrates! So, I am going to draw a large bubble and place it at the center of my concept map and write "Invertebrates" inside (Walk over to white board and draw a large bubble and write the word "Invertebrates" inside). (Walk back to SMART board.)*
- *I also know the definition for invertebrates is an animal without a backbone and that seems important, so I am going to add a "Definition" bubble underneath (add the definition bubble). Now, I want to show that the definition is for invertebrates so I am going to draw a line connecting the "Invertebrates" bubble to the "Definition" bubble (draw line).*
- *We also listed a bunch of examples of invertebrates. That will probably help me remember things later, so I am going to add some example bubbles around my "Definition" bubble. Draw smaller bubble connected to "Definition" bubble and add the examples students listed.*
- *Okay, what else did the teacher talk about today? (Walk over to the SMART board and look.) It looks like we were talking about adaptations invertebrates have, so I'm going to make a new bubble and label it "adaptations". (Walk over the white board and draw new bubble). I'm going to add the definition of adaptation to my bubble (write definition in same bubble). Now, I know that these two concepts invertebrates and adaptations are connected because I am going to be looking at how invertebrates are adapted to their environments today so I'm going to draw a line connecting the two bubbles (draw line).*
- *(Go back and look at SMART board.) Okay, I think I have all the important information. (Walk over to concept map.) Alright, let me make sure this makes sense now. I know that Invertebrates are animals without a backbone (point at "invertebrates" bubble) and xx, xx, xx and xx are examples that fit that definition. I also know that invertebrates have adaptations (point to adaptations bubble) that help them survive. After the lab today I better add some of the adaptations I learn about to this concept map.*



Invertebrate Adaptation Lab (90 min):
Goal: Students study living rocky seashore invertebrates and perform an experiment to see how invertebrates are adapted for the rocky seashore environment.

Introduction (15 min):

- Review the physical environment at the seashore the students visited the day before.
    - (Play 1-2 minutes of a Rocky Seashore video in Ocean Leader Bridge PowerPoint to help remind students.)
    - Ask students to describe what they see or what they remember seeing about what it was like at the seashore.
    - Focus on the physical environment:
        - Rocks
        - Waves
        - Sun
        - Lack of water at times
    - The rocky seashore is a harsh environment and the invertebrates that live there must be adapted to survive in those conditions.
        - Ask students to define adaptation.
            - Adaptation: something that helps an animal to survive in its environment.
    - Today we will focus on how invertebrates are adapted to waves.
        - Invertebrates do not want to get washed away or knocked over by waves so they must be adapted not to.
    - Today you will get to experiment with body shapes you think might work best for life at the rocky seashore.
- Introduce activity:
    - (Utilize Invertebrate Experimentation slide in Ocean Leader Bridge PowerPoint.)
    - Goal: To build an invertebrate out of clay that you think could survive at the rocky seashore.
        - You will have 20 minutes to study living rocky seashore invertebrates and think about how they are adapted to survive at the rocky seashore.
        - You will then be given a piece of clay to build an invertebrate that you think would be adapted to survive at the rocky seashore.
        - You will then place your clay invertebrate on our “rocky seashore”.
            - (Show the plexiglass angled in the plastic tub.)
        - I will then create a “wave” using this bucket of water.
            - (Hold up an orange home depot bucket.)
        - As a group we will then analyze our data and see what types of body shapes are best adapted to living at the rocky seashore.
        - Questions?

Living Invertebrates (25 min):

- Goal: Observe living rocky seashore invertebrates and make observations about what adaptations they have to help them to survive at the rocky seashore.
    - You will have time to visit 3-4 different invertebrates before building your own.
    - Focus on what adaptations might help these invertebrates survive the waves at the rocky seashore.
    - (Have students open to the “Invertebrate Experiment” page in their science notebook.)
    - Show them space in science notebook to write down any notes or sketch a protype invertebrate they might like to build.
    - When you are observing an invertebrate remember:

        - You may hold it gently and/or touch it with two fingers.
        - Be respectful of the invertebrates. Don't squeeze or pull them.
- (Instructor and IPM to place an invertebrate in a small aquarium in front of each pair of students.)
    - (Let students observe the invertebrate in front of them for 3 minutes while staff walk around and talk to students.)
    - Give students 1-2 minutes to make notes and draw pictures in their science notebook.
- (Have students rotate in a circle to the next invertebrate and repeat above sequence two more times.)
- (IPM will return to take invertebrates back to tank.)

<u>Build an Invertebrate</u> (5 min):
- Goal: Remind students their goal is to build an invertebrate out of clay that will survive at the rocky seashore.
    - You will have five minutes to build an invertebrate that you think will survive at the rocky seashore. Use your notes/drawings in your science notebook to help.
    - (Give each student a piece of clay.)
    - (Set digital timer for five minutes.)
    - (Start timer.)
    - Give students a two-minute and one-minute warning.
- (Have student stop working and bring clay invertebrates up to plexiglass in the bucket).

<u>Experiment</u> (5 min):
- (Once all invertebrates are attached to the acrylic panel, have students step backwards out of the "splash zone" forming a socially distanced half circle.).
- (Take the bucket and create a "wave" by dumping the water over the entire panel. BE CAREFUL not to create too strong of a wave that knocks everything off!)
- (Take the clay invertebrates that fell off and place next to the "non-survivor" laminated card.)
- (Take the clay invertebrates that stayed attached and place next to the "survivor" laminated card.)

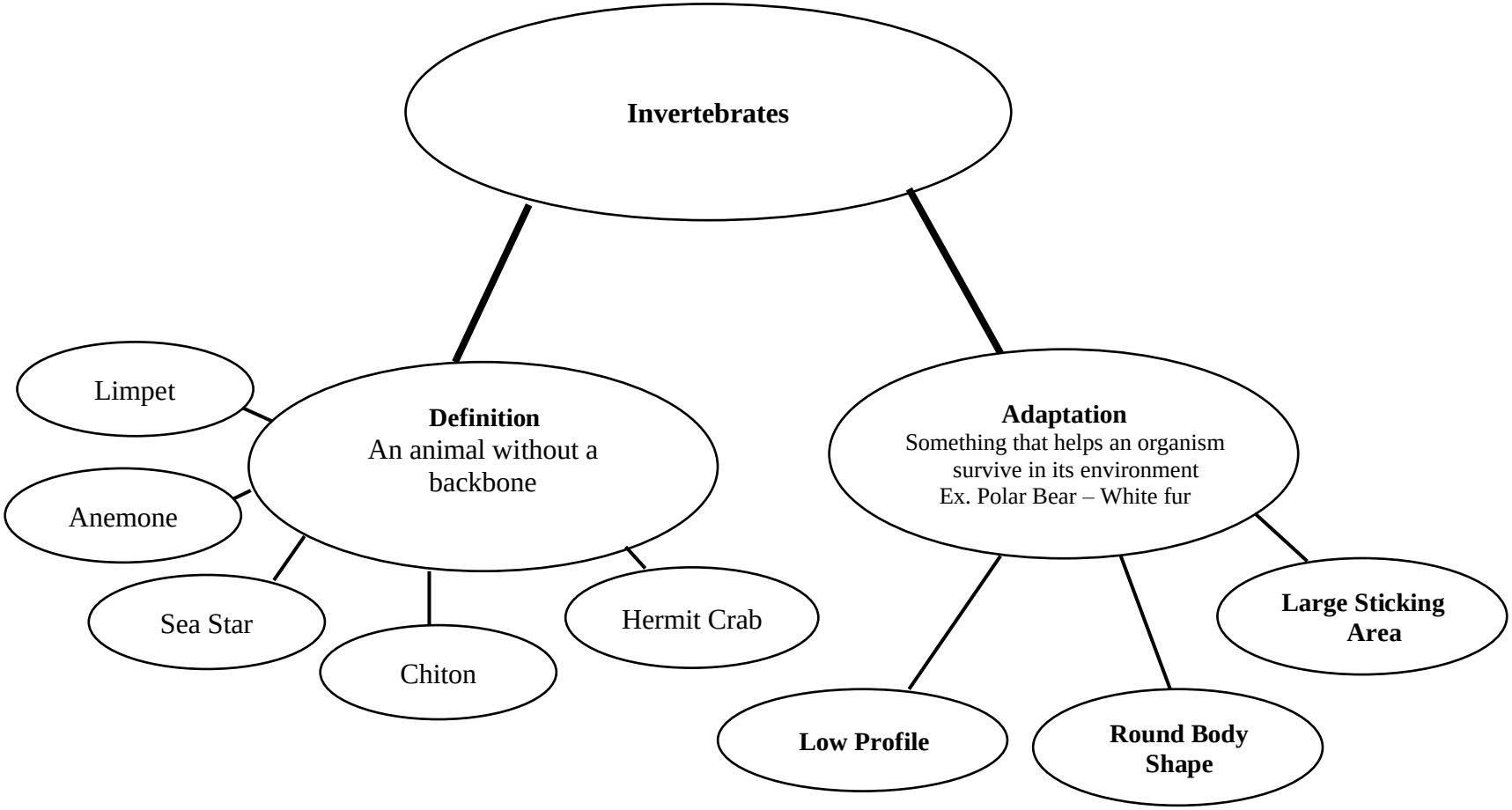
<u>Analyze Data/Rebuild</u> (10 min):
- Have students stand socially distanced around the survivors and the non-survivors and silently consider the prompt:
    - What similarities do you notice among the survivors?
- Explain they will get a chance to build one more invertebrate using this new information.
- (Give students 1-2 minutes to observe then give them another piece of clay and set a timer for building their final invertebrate.)

<u>Repeat experiment</u> (5 min)

<u>Analyze Data/Debrief</u> (20 min):
- Analyze data from experiment to determine what kinds of adaptations can help invertebrates survive at the rocky seashore.
    - Ask students to look at "survivors" to find similarities that helped them stay attached after the wave. Potential questions include:
        - What similarities do you notice about the survivors?
        - What do you think helped these invertebrates stay stuck to the rocky seashore?
- Rocky seashore adaptations: (Write these on the board.)
    - <u>Low profile</u> (students may use words such as: short, low, etc.)

        - Less surface area to be impacted by a wave versus a tall organism which would absorb more of the force of a wave.
        - (Kinesthetic Body Movement: Stand up straight with legs together and arms at sides.)
    - Large sticking area (clarify that size of the sticking part is most important not simply a large size animal.)
        - Larger surface area to stick to rocks.
        - (Kinesthetic Body Movement: Have students hold all their fingers up and spread out like tube feet.)
    - Round body shape (hydrodynamic) – versus a blocky or more square shape.
        - Reduces the pressure of water which flows around this body shape.
        - (Kinesthetic Body Movement: Make a circle with both hands and move it them in a circle.)
- Review the concept and Mantra of Knowing and Owning your knowledge.
    - You have learned several things from this experiment - we now know several adaptations invertebrates have to help them survive at the rocky seashore.
    - It is time to take that new information and organize it with our existing knowledge so that it makes sense, and we KNOW it.
    - (Point to the KNOW on the Mantra Poster.)
- Return to concept maps.
    - (Have students open their science notebooks to the concept map they created earlier.)
    - (Return the concept map on the whiteboard.)
    - The concept map is a good tool to help us organize our new knowledge. Today we will add to this concept map together.
- Expand on concept map.
    - (The goal is to have students add the below to their concepts maps (SEE EXAMPLE BELOW)):
        - Rocky seashore adaptations (low profile, large sticking area, and round body shape) – connected to rocky seashore bubble
        - Examples of invertebrates – connected to invertebrate bubble.
    - Potential questions include:
        - (As students provide information on what and where to add information to the map add that information onto your whiteboard concept map).
        - What did you learn about invertebrates today that you would want to add to this concept map?
        - Where on the map would you place that information?
        - What would you connect it to?

Example: Expanded Concept Map #1



Office Hours (30 min)
Goal: Students build comfort with the concept of office hours and asking teachers/professors questions in order to build future confidence for attending extra help in high school and office hours in college.

- Intro (5 min)
  - Most days after science labs we will have office hours.
  - Office hours are something that will be available to you in college as well.
  - Office hours are a time to meet with your professors outside of class to clarify your understanding and ask questions.
  - Some students find it intimidating to go to office hours, but professors WANT you to come. Remember a teacher wants you to do well in their class so they want to help you understand the material and answer your questions.
  - When you go to office hours it can be helpful, but not necessary, to have questions to ask your professor.
  - Today we will have our first office hours. You will choose an "office" to go to and work with that instructor or mentor to answer any questions you have about what you learned over that last two days.
  - Remind students what they have done over the last two days.
  - Have students write down at least one question to ask in office hours.
    - (Show Question Sentence Starters slide in Ocean Leader Bridge PowerPoint.)
      - I want to know more about…
      - I'm confused about….
      - I wonder….
    - (Remind students they may have questions written down in their science notebooks.)
  - Give students 2-3 minutes to write down a question. Check that each student has at least one question.
    - ***Teaching Note: During this time send mentors to their "office hour" spaces.***

- Office Hours Sign-up (5 min):
  - We will spread out during Office Hours so that we are in smaller groups and can more easily ask questions.
  - You may end up at an Office Hours with scientists from another cohort.
  - In order to make sure we don't have too many people in one space everyone will sign up an Office Hours location using a laptop.
  - No Office Hours location can have more than three people.
  - Once you have selected a location simply type your name into that box.
  - If you see that a box already has three names you will need to choose another location.
  - Everyone can type in the document at the same time.
  - Questions?
  - (Allow students to open laptops and choose a location for Office Hours.)

- Office Hours Transition (3 min)
  - (Play musical cue to throughout Living Lab to let all groups know it is time to move to their office hours location.)
  - (Team Leads and students walk to Office Hour locations.)

- Office Hours (15 min)
  - (Invite students to sit together at one table.)

- Welcome students to Office Hours.
- Explain that this is a space for students to ask questions and clarify information.
- Remind students that the question(s) they have is written in their science notebook if they forgot.
- Go around the group and ask each student to share their question.
    - When a student shares a question – do you best to answer it or have other students help to answer the question.
    - If you do not know the answer to a question, explain to students that you will not know the answer to every question but that you have resources such as the internet to find answers.
        - (Have students use laptops to research the answers.)
- (Last two minutes of office hours a musical cue will sound for everyone to return to their cohort.)
    - Be sure the space you are in is left exactly as you found it.
    - Take laptops back to original room.

Science Labs

Day 5

Goals: Students are engaged in exciting science programming that focuses on understanding invertebrate conservation and sharing that message with others.

Timing:

Time	Activity	Schedule
45 minutes	Community Building	9:00 – 9:45AM
30 minutes	Zoom Meeting with Science Leader	9:45 – 10:15AM
90 minutes	Canyon Invertebrates & Invasive Removal	10:15 – 11:45AM
30 minutes	Conservation Message: Invertebrates	11:45 – 12:15PM
15 minutes	Chores & Announcements	12:15 – 12:30PM
30 minutes	Lunch	12:30 – 1:00PM
60 minutes	PEN Program	1:00 – 2:00PM

Supplies:

Zoom Meeting with Science Leader:

- SMART board (2)
- Speaker (2)
- Microphone (2)
- Microphone stand (2)
- Camera (2)
- Curiosity cubes (1 set/group)

Canyon Invertebrates:

- Canyon Plant ID card (1/student)
- Butterfly net (1/group)
- Bug boxes (5-7/group)
- Hand lenses (1/student)
- Canyon Invertebrate ID card (1/student)

Invasive Removal:

- Trowel (1/student)
- Blue bucket (1/student pair)
- Work gloves (1 pair/student)
- Spring scale (1/group)
- Calculator (1/group)

Conservation Message: Invertebrates

- Construction paper (30 sheet cut in half/group)
- Magic Markers (3-4 sets/group)
- Assorted stickers/glitter glue/etc.
    - For decorating Conservation Tweets

Intensive Program Manager

- Collect all Conservation Tweets at the end of the day to be put aside for Family Celebration night.

Set Up

- Set up technology and test for Zoom call with scientist.
- Have curiosity cubes (2/group)

Teaching Notes for Assistant Team Lead

- During Zoom Meeting with Science Leader:
  - Connect the zoom link(s).
    - Check sound.
    - Check that the camera shows as many students as possible.

Mentors

- Be sure there is at least one adult monitoring each table.
- Participate in all activities.
- During visit to SIO:
  - Encourage students to use their networking skills with new adults.
- During Canyon Invertebrates activity:
  - Make sure students stay within boundaries.
  - Help students find different invertebrates or evidence of invertebrates.
  - Remind students to draw their four invertebrates in their science notebooks.
  - Potential questions include:
    - Do you think what you are looking at is an invertebrate? Why?
    - What kind of adaptations do you think your invertebrate has to survive here in the canyon?
    - How does that ____ help your invertebrate to survive here?
    - Do you think scientists do work like this?
- During Invasive Species Removal:
  - Make sure students stay within boundaries.
  - Double check that plants students want to remove are invasive using Canyon Plant ID card.
  - Help students remove invasive plants by the roots.
- During Conservation Message: Invertebrates:
  - Help students brainstorm ideas for a conservation tweet. Questions for them to consider:
    - What do you want others to know about invertebrate conservation?
    - Is there a concrete solution you can share in a tweet?
  - Help students make sure their messages are not too long.

<u>Zoom Meeting with Science Leader</u> (20 min):

- Provide an overview of the Science Leader Interview.
    - Each day we focus on conservation we will meet with a science leader who works in the field of conservation.
    - Will learn about their pathway to becoming a science leader and what they do in their work.
    - Will hear about their passion for protecting the organisms we have been studying.
    - You will have the opportunity to come to the microphone and ask the scientist directly any questions you have.
        - Show students curiosity cubes.
        - Explain how they work and how students can use them during the interview.
- Introduce Science Leader.
    - Tell the students who they are about to meet (scientist's name) a scientist who (describe what they do in 1-2 sentences).
    - (Connect Zoom Call).
    - (Welcome the Science Leader.)
    - (Conduct the interaction as one would an interview.)
        - <u>Interview tips</u>:
            - You may wish to change the order or modify the questions based on the science leader's responses.
            - If a science leader is answering a question that may need to be wrapped up, you can move to the microphone which will signal them that you want to speak.
            - After the science leader answers a question, in a sentence or two, you can reaffirm the point they are making or acknowledge something about how it ties to the students' experience.
        - <u>Potential interview questions</u> (you do not need to use all):
            - Can you start by sharing more about yourself and how you came be the Science Leader you are today?
            - Can you share something that was challenging to you on your pathway to becoming a science leader and how you overcame this challenge?
            - We'd love to hear more about your work. Can you describe your work in a few sentences?
            - For the last few days, we have been studying invertebrates. We are interested in what is being done to protect such important organisms. Can you tell us how your research or work helps to protect invertebrates?
            - I know you shared a bit about your job as a scientist, but were curious to learn one or two things you love about your job?
            - What is one piece of advice you have for these future science leaders?
            - Can you share one thing that you do, or your organization does that is really cool?
        - <u>Student questions</u>:
            - Give one or two students the chance to ask questions.
            - If needed, remind them about the curiosity cubes.
    - (Have students say, "Thank you!" and clap for the science leader.)
    - (Disconnect Zoom call.)

<u>Canyon Invertebrates & Invasive Removal</u> (90 min):

<u>Canyon Invertebrates Intro</u> (10 min):

- We have been studying invertebrates that live at the rocky seashore, but it is important to realize that invertebrates can be everywhere on earth including right outside our doors here at the living lab.
- Review the physical environment in the canyon.
    - Remind students that they spent time in the canyon on the first day when they participated in the Ocean Discovery Leadership Challenge.
    - (Play 1-2 minutes of a canyon video in PPT to help remind students.)
    - Ask students to describe what they see or what they remember seeing about what it was like in the canyon.
    - Focus on the physical environment– hot, sunny, lack of water, plants everywhere.
    - The canyon is a different environment than the rocky seashore and therefore canyon invertebrates have to be adapted for that environment.
        - Ask student if they think rocky seashore invertebrates could live in the canyon? Why not?
- Introduce activity. Be sure to cover:
    - We will go out and explore the canyon with the goal of finding invertebrates and learning how they are adapted to live in the canyon.
    - (Have students open to Canyon Invertebrates page in their science notebook.)
    - Ask students to divide the page into four quadrants using a vertical and horizontal line.
        - (Demonstrate how to do this on the SMART board.)
    - While out in the canyon find at least four invertebrates to make notes about.
        - Make a sketch and label as many adaptations as you can for each invertebrate you find.
        - Write down any questions you have about that invertebrate.
        - (Do an example on the SMART board: Sketch a turtle and label some adaptations turtles have. Ask students what questions they have about turtles and write those questions down in the same box as the sketch).
    - We will have some tools to help catch and/or examine any invertebrates we find.
        - (Show tools and explain how to use each one.)
            - Butterfly net
            - Bug box
            - Magnifying lens
            - Canyon Invertebrate ID card
    - Remember invertebrates are living things so respectful.
        - Touch- or pick-up invertebrates gently.
        - Return an invertebrate to where you found it when you are done.
        - If you catch something in the butterfly net be very gentle when taking it out so you don't harm the animal.
    - Questions?

<u>Canyon Invertebrate Collection</u> (25 min):

- (Walk students out to the canyon.)
- (Set boundaries for exploring the canyon.)
- (Send one adult to stand at each end of the boundaries.)
- (Allow students to explore and collect invertebrates.)

- Staff should walk around and interact with students and remind them to take notes in their science journal. Potential questions include:
    - Do you think what you are looking at is an invertebrate? Why?
    - What kind of adaptations do you think your invertebrate has to survive here in the canyon?
    - How does that ____ help your invertebrate to survive here?
    - Do you think scientists do work like this?
- (Give students 5-minute and 2-minute warnings.)
- (Walk students back to lab in the last five minutes.)

Debrief (10 min):

- Review the concept and Mantra of Knowing and Owning your knowledge. Be sure to include:
    - You have learned several things today during your science labs.
    - Now is the time to take that information and organize it so that it makes sense.
    - (Point to the KNOW on the Mantra Poster.)
- Return to invertebrate concept map. Be sure to include:
    - It is important to expand on a concept map with new things that you learn. Today we will add to this concept map together.
- Expand on concept map.
    - (The goal is to have students add the following to their concepts maps:
        - Canyon adaptations (whatever types they discovered) – connected to adaptations bubble
        - Examples of invertebrates – connected to definition bubble.
    - Potential questions include:
        - (As students provide information on what and where to add information to the map add that information onto your whiteboard concept map).
        - What did you learn about invertebrates today that you would want to add to this concept map?
        - Where on the map would you place that information?
        - What would you connect it to?

Invasive Removal Intro (10 min):

- Over the last few days, we have learned invertebrates can be found everywhere from the ocean to the canyons.
- We have also learned how these invertebrates are adapted to their environment.
- Introduce conservation.
    - As scientists it is important that we not only learn about science, but we also take that information and try to make a difference in the world.
    - Now that we know so much about invertebrates it is important as science leaders to think about how we can help protect them.
    - Define conservation: careful protection of something.
    - Reference science leader they met earlier.
        - (i.e., Remember (scientist's name) who we talked to on Zoom? They are studying xx and helping to make a difference by xx.)
    - Now, it is time for YOU will work to make a difference in the world and help conserve invertebrates!
- Introduce invasive plant removal:
    - Today we will return to the canyon to help local invertebrates.
    - Introduce invasive.

        - All of the plants that we saw in the canyon are not actually supposed to be there – they are called invasive species.
        - Definition: a species that is not normally found in that area
        - These invasive plants are not naturally found in the canyon and should not be there. Invasive plants are bad because they take up space that native plants – plants that belong in the canyon – would normally use.
        - Native plants provide habitat for the invertebrates that live in the canyon.
        - Ask students if they think it would be better for invertebrates to have more invasive or more native plants in the canyon. Why?
            - We want more native plants because they provide food, places to hide and homes for the invertebrates.
        - Today we will help make a difference in our canyons by removing some invasive plants.
    - (Pass out Canyon Plant ID cards.)
    - Show students both sides of the plant id card.
        - Native side and invasive side.
    - When you are in the canyon today and you think you have found an invasive plant- call over a staff member to confirm.
    - Then you can work with your hands and a shovel to remove the invasive plant.
        - It is best to remove as much of the root structure as possible, so the invasive plant does not grow back.
    - Place the invasive plant into your blue bucket.
    - At the end of the day, we will weigh the blue buckets to see how many pounds of invasive plants are removed today!
    - (Hand each student a blue bucket, gloves, and a trowel.)

<u>Invasive Plant Removal</u> (20 min):

- (Walk students out into canyon.)
- (Show students how to properly remove an invasive plant.)
- Explain physical boundaries that students can work within.
    - (Post an adult at each boundary and make sure all students are within the sight of at least one adult.)
- (Give five and two-minute warnings.)
- (Count students and walk back to lab.)

<u>Analyze Invasive Plants</u> (15 min):

- (Utilize Student Expert Roles slide in PPT.)
- Create/assign student expert roles:
    - Data scribe (1): Will write invasive plant weights on the smartboard
    - Mathematician (1): Will use the calculator to add total amount of pounds of invasive plants
    - Lab technician (1): Will gather all the invasive species from the buckets into a large trash bag to be disposed of.
- Weigh Invasive Plants:
    - Have **each student** place their blue bucket on the spring scale and share the weight in pounds to group.
    - (**Data scribe** will record all the answers)

  - Have **each student** place the invasive from their blue bucket into the trash bag the **Lab technician** has**.**
  - Have **each student** place their blue bucket in a pile to the side.
  - (Repeat the above until all blue buckets have been weighed.)
  - **Mathematician** will add the total pounds of invasive plants removed and announce the total to the group.
- Great job making a difference today scientists!
- Together you cleaned up xx pounds of invasive plants from the canyon! That's amazing!
- You have helped protect the invertebrates that live in the canyon by removing invasive plants and making room for native plants that provide food and housing for local invertebrates.

<u>Conservation Messages: Invertebrates</u> (30 min):

Goal: Students will create a tweet about invertebrate conservation that will be shared with their family and friends during the Family Celebration.

<u>Intro (10 min)</u>:

- Debrief the invasive plant removal. Potential questions include:
  - What surprised you about the number of invasive plants in the canyon?
  - How does removing invasive plants help invertebrates?
  - What could be a next step to help the invertebrates in the canyon?
  - How could human help to protect invertebrates in the ocean or the canyon?
    - Try to get students to come up with simple concrete solutions.
      - Ex. Use cloth grocery bags, plant native plants, pick up trash near the ocean, etc.
- As a science leader it is important to share what we know with others – particularly when it comes to conservation.
  - Soon we will have the opportunity to share what we know with our Family and Friends during Family Celebration night at the end of the program.
  - We will want to tell people why it's important to protect these organisms or how they can help protect these organisms.
    - Since we won't have a lot of time to share our conservation messages, we will need to make them, short-in the form of a tweet.
  - Review what a tweet is: a short message with 140 letters or less.
    - Example Tweet: Turn off your lights and turn down Climate Change!

<u>Brainstorm (10 min):</u>

- (Have students open to Invertebrate Conservation page in their science notebooks.)
- (Show Invertebrate Conservation slide on Ocean Leader PowerPoint.)
- We will use the next 10 minutes to brainstorm ideas about our conservation message. Things to consider when writing your tweet
  - What do you want others to know about invertebrate conservation?
  - Is there a concrete solution you can share?
- You will need to count your letters and make sure your message is no more than 140 characters!
- You can write as many messages as you want in your science notebook. They do not have to be perfect.
- (Set digital timer for 10 minutes.)

Write & Decorate Tweet for Conservation Tree (10 min):

- Explain to students that they will pick their favorite conservation message tweet to share with everyone at the Family Celebration.
- They will write this tweet on piece of construction paper which will be hung from a large tree in the Plaza Del Sol the night of the Family Celebration where people can read their messages.
- After you have written you tweet feel free to decorate your paper.
- (Give students 5 minutes to work on conservation tweet.)
- (If time allows have a few students share their tweets.)
- (Collect all tweets to be hung on Conservation Tree later.

Science Labs

Day 6

Goals: Students are engaged in exciting science programming that focuses on understanding what fish are and the difference between bony and cartilaginous fish.

Timing:

Time	Activity	Schedule
45 minutes	Community Building	9:00 – 9:45AM
75 minutes	Shark and Bony Fish Dissection	9:45 – 11:00AM
30 minutes	Fish Lecture & Concept Map #2	11:00 – 11:30AM
30 minutes	Study Hall #1	11:30 – 12:00PM
15 minutes	Thank You's	12:00 – 12:15PM
15 minutes	Chores & Announcements	12:15 – 12:30PM
30 minutes	Lunch	12:30 – 1:00PM
60 minutes	PEN Program	1:00 – 2:00PM

Supplies:

Shark and Bony Fish Dissection:

- Jarred fish (1/student)
- Dogfish Shark for dissection (1/pair of students)
- Bony fish for dissection (1/pair of students)
- Dissection tray (1/pair of students)
- Dissection scissors (1/pair of students)
- Scalpel (1/pair of students)
- Gloves (2 pairs/student)
- Hand Sanitizer (2/group)
- Whiteboard Marker (1/student)
- White board + stand (1/group)
- Whiteboard markers (2/group)
- Dry erase board eraser (1/group)
- Butcher paper
- Tape (2 rolls)
- Trash bags (4)

Study Hall:

- Index cards (6/student + 20 extra)
- Large paperclip (1/student + 5 extra)

Thank You's

- Mentor thank you gifts (6)
- Digital camera (1)

Visuals:

- Laminated internal & external anatomy of a shark (8 x 11 in.) (1/student)
- Laminated internal & external anatomy of bony fish (8 x 11 in.) (1/student)

Intensive Program Manager

- After Science Lab:
  - Throw away shark/fish carcasses.
  - Throw dirty rags and towels into laundry.
- For Thank You's:
  - Take Mentor Thank You photo.
  - Bring Mentor Thank You gifts.

Set Up

- For Concept Map and Lecture activity:
  - Set up a whiteboard and stand near the SMART board.
  - Hang up the KNOW and OWN Knowledge Mantra Poster
- For Shark and Bony Fish Dissection:
  - Cover each table with butcher paper for dissection.
  - Set a jarred fish at each seat.
  - Open and rinse the sharks. Try to have some males and females.
  - Set dissection tools off to the side.

Teaching Notes for Team Lead

- During Chores & Announcements remind students what they need to bring for field trip tomorrow:
  - Hats
  - Sleeves
  - Water bottle
  - Sunglasses
  - Closed-toed shoes

Mentors

- Be sure there is at least one adult monitoring each table.
- Participate in all activities.
- During the Shark and Bony Fish Dissection Intro you have a **Mentoring Opportunity**:
  - While students are observing fish ask questions. Potential questions include:
    - What similarities do you notice between the fish in the jar and the one on the tray?
    - What do you think might define what a fish is?
- During Shark and Bony Fish Dissections you have a **Mentoring Opportunity**:
  - What do you see/feel?
  - What might that help the shark/fish to do?
  - What part of the shark/fish do you think that is?
  - What do want to know more about/what questions do you have?
  - Share an interesting fact or story with students about sharks/fish or a particular body part.
- During Study Hall you have a **Mentoring Opportunity**
  - Walk around and help students create flash cards.
  - Help students study during independent study time.

Shark & Bony Fish Dissection: (75 min)
Goal: Students dissect a cartilaginous and a bony fish to determine what similarities and differences both fish have.

Intro to Fish: (10 min)
- Explain that today we will be moving to a new topic: Fish!
- In front of you are two types of fish – one in a jar and one on the dissection tray.
- Our goal is to try and figure out what a fish is.
- Ask students if they think fish are invertebrates? – No.
    - Define vertebrate- animal with a backbone
    - (Write on SMART board under "Fish" – "vertebrate")
- (Have students examine the fish in front of them to come up with other characteristics they believe might describe a fish.)
- Pair-Share
    - What are some things that you notice are similar on both the shark and your jarred fish?
    - (Write student responses on the board.)
- Create a definition of fish:
    - A vertebrate, that lives in the water, and has fins, gills, and scales.
- Today we will get a chance to look more closely at two kinds of fish – a cartilaginous fish and a bony fish.

Intro to Shark Dissection: (5 min)
- Start by taking a closer look at a shark which is a cartilaginous fish!
- Ask students to try to define dissection.
    - Dissection: to cut open a plant or animal to study its internal body parts.
- Ask students why would we do a dissection?
    - To learn more about a plant or animal.
- Remind student to respect the shark they are dissecting.
- Review potential reactions to dissection:
    - Whatever you feel is appropriate.
    - Excited, nervous, etc.
    - Students can take a quick break if they need to step away but should hurry back so they don't miss too much exploring.
    - Review mantra:
        - We never say "gross!", instead we day "Ooooohh science!"
- Review Covid protocols.
    - Students will push tray back and forth across the table as they look at their dissection animal.
    - Students should not be on the same side of the table.
- (Pass out gloves)
- Remind students not to touch themselves after they have touched the shark even with gloves on.
- (Pass out Laminated internal & external anatomy of a shark and a dry erase maker to each student.)

External Shark Anatomy (15 min):
- Explain external exploration – outside of shark.
    - (Show slide of the external anatomy of the shark from PPT.)
    - (Point out word bank to use with their laminated card.)

- Explain that students should look at the shark, touch it, and make some observations, like what do you think each of the different parts are and what do they do?
- Direct student's attention to the list of body parts and diagram on the SMART board explain that students will have their own laminated version of the diagram and they can try to match up the body parts on the list with where they are on the shark and write it on their diagram.
- (Give students 5 minutes to explore the outside of the shark and label the diagram while staff and mentors walk around and interact with students.)
- (When time is up bring students together to debrief external anatomy of shark.)
- (Have students help you fill in the external diagram on the SMART board.)
- Share stories and/or interesting facts about the external anatomy features (*See Instructor Supplement for information*):
    - Senses for sensing predators and prey
        - Eyes – for seeing
        - Nostrils – for smell
        - Ampullae of Lorenzini – sense electromagnetic fields
        - Lateral Line
    - Mouth
    - Gill slits
    - Dermal denticles
    - Caudal fin
    - Dorsal fin
    - Pectoral fin
    - Cloaca
    - Claspers

<u>Internal Shark Anatomy</u> (15 min):

- Explain internal exploration – inside of shark.
    - (Show slide of the internal anatomy of the shark from PPT.)
- Explain that students that after they open the shark they should look at the internal anatomy, touch it, and make some observations, like what do you think each of the different parts are and what do they do?
- Direct student's attention to the list of body parts and diagram on the SMART board explain that students can flip over their external anatomy diagram and try to match up the body parts on the list like they did with the internal anatomy.
- (Pass out dissection equipment to students).
- (Show students how to cut open shark using scalpel and scissors.)
    - (Use the scalpel to cut a horizontal line from pelvic fin to pelvic fin (horizontal) and pectoral fin to pectoral fin (horizontal), then use the scissor to cut vertically up from one cut to the other.)
- (Give students 5 minutes to explore the inside of the shark while staff and mentors walk around and interact with students.)
- (When time is up bring students together to debrief internal anatomy of shark.)
- (Have students help you fill in the internal diagram on the SMART board.)
- Share stories and/or interesting facts about the internal anatomy features:
    - Heart
    - Liver
    - Stomach
        - Cut open the stomach and see if there is undigested food.

  - Intestines
  - Cloaca
  - Gonads
    - Try to identify any pregnant females and cut open the egg to see the babies attached to their yolk sac.
- (Place all sharks to the side – do not throw away.)
- (Have all students remove and dispose of gloves.)
- (Have students wash hands/bathroom break.)

External Bony Fish Anatomy (10 min):

- (Pass out Laminated internal & external anatomy of bony fish to each student.)
- Explain to students that now we will be looking at another type of fish – a bony fish.
  - (Show slide of the external anatomy of the bony fish from PPT.)
- Explain to students that just like with the shark we will look at the external anatomy first.
- Direct student's attention to the list of body parts and diagram on the SMART board. Tell students they can try to match the body parts to the diagram as they work.
- (Give students 5 minutes to explore the outside of the fish while staff and mentors walk around and interact with students.)
- (When time is up bring students together to debrief external anatomy of fish.)
- (Have students help you fill in the external diagram on the SMART board.)
- Share stories and/or interesting facts about the external anatomy features:
  - Scales
  - Fins
  - Lateral Line
  - Operculum
  - Eye
  - Mouth

Internal Bony Fish Anatomy (10 min):

- Explain that just like the shark we will now open the fish up to look at it's internal anatomy.
- Direct student's attention to the list of body parts and diagram on the SMART board. Tell students they can try to match the body parts to the diagram as they work.
- (Show students how to cut open the fish using scalpel and scissors.)
  - (Cut open the fish with an incision from the anus to the pectoral fins, two additional incisions both perpendicular to the ends of the original incision may be necessary to provide a better view of the internal organs.)
- (Give students 5 minutes to explore the inside of the fish while staff and mentors walk around and interact with students.)
- (When time is up bring students together to debrief internal anatomy of a fish.)
- (Have students help you fill in the internal diagram on the SMART board.)
- Share stories and/or interesting facts about the internal anatomy features:
  - Gills
  - Intestines
  - Gonads-sex the fish
    - female will have a large pink ovary-this can be cut to expose thousands of eggs
    - male will have white testes, which provide sperm
  - Stomach

        - (You may need to remove the gonads to be able to see the stomach and swim bladder)
        - Cut open the stomach and see if there is undigested food.
    - Swim bladder

Comparison of Bony Fish & Cartilaginous Fish (10 min):

- (Have students place both fish side by side.)
- Remind students that shark is a cartilaginous fish (point to this word on SMART board) and the other is bony fish (point to this word on the SMART board).
- Ask students to explain why bony fish are called bony fish.
- Ask students to explain why cartilaginous fish are called cartilaginous.
- Think-Pair-Share
    - What are the differences between cartilaginous and bony fish?
    - (For the share out portion – write characteristics that students describe under the type of fish it belongs to on the SMART board.)
    - Be sure to cover:
        - Cartilage vs. Bone
        - Gill slits vs. Operculum
        - Oily Liver vs. Swim bladder
        - Heterocercal caudal fin (lobes of unequal size) vs. Homocercal caudal fin (lobes of equal size)
- (Place the sharks and fish in a trash bag and then add a second bag for disposal.)

Fish Lecture & Concept Map #2: (30 min)
Goal: Students practice how to take information from a lecture and organize it for understanding (KNOW) through building a concept map.

Intro: (5 min)

- Remind students of the concept of Knowing and Owning information. Be sure to cover:
    - Knowing (KNOW) – learning information through the development of concept maps and asking questions to solidify understanding
    - Owning (OWN) – memorizing, discussing, applying and teaching others about the knowledge they KNOW.
- Knowing how to learn and remember information from a lecture is an important skill we have practiced once and we will practice again today.
- Today we will have a short lecture and then we will work together to take the information and organize it into a concept map so we can use to remember what was taught – that is the (KNOW) part.
- After that you will have your first Study Hall where you will start to work towards OWNing your knowledge.

Lecture: (10 min)

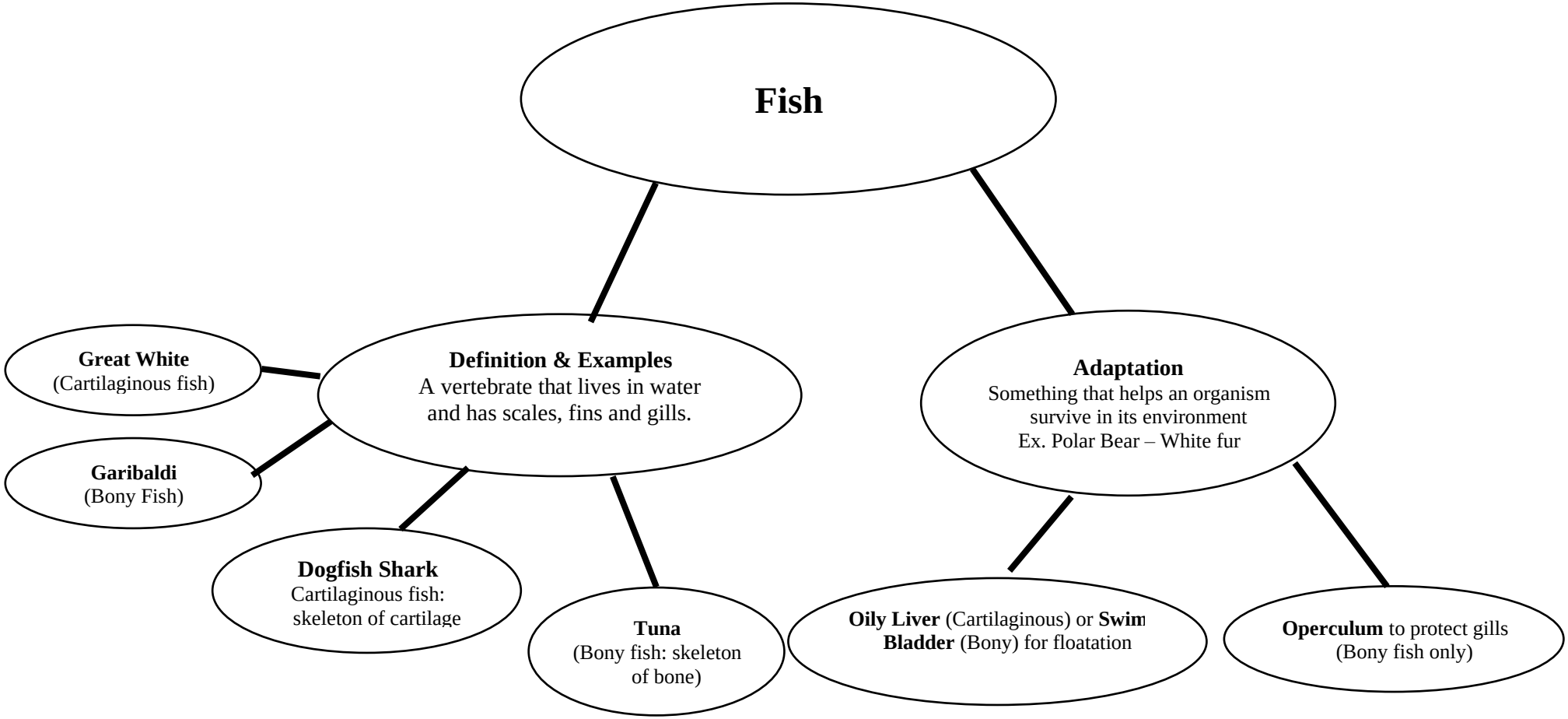
- (Have students take out their science notebooks and turn to Fish Lecture Notes and Concept Map.
- Explain that students should take notes during the lecture. Tell students there will only be one slide of notes today.
- (Give lecture using Fish Lecture slide in Ocean Leader Bridge PowerPoint.)
    - Fish

        - Definition: A vertebrate, that lives in the water, and has fins, gills and scales
    - Examples:
        - Be sure students name both Cartilaginous and Bony Fish:
            - Dogfish Shark, Great white, Hammerhead, etc. (Cartilaginous)
                - Cartilage - Like human ear/nose tip
            - Bluefin Tuna, Sole, Garibaldi, etc. (Bony)
                - Like human bones
    - Adaptations (use whatever adaptations the students think of and ask them which kind of fish it is an adaptation for). Poential examples:
        - Flotation:
            - Oily liver (Cartilaginous)
                - Oil is lighter than water – keeps sharks floating in water column instead of sinking
            - Swim bladder (Bony)
                - Fills with air to allow fish to move up and down in water column
        - Gills
            - Operculum (Bony fish)
                - Hard plate protect the fish's soft gills
        - Outer covering
            - Dermal denticles (Cartilaginous fish)
            - Scales (Bony fish)

<u>Build a Concept Map</u> (15 min)

- (Keep lecture slide up on the SMART board.)
- Review building a concept map. Be sure to cover:
    - (Have students return to their invertebrate concept map to look over.)
    - Take the information that you wrote down during the lecture and organize it in a way that makes sense and helps us to KNOW the information.
    - Think about how we created a concept map around invertebrates.
    - Today, we will work together to create a concept map with our new information.
    - You do not need to copy the concept map until the end.
- (Have students help you build a concept map on whiteboard by asking questions.)
    - **(Not all concept maps will look the same or like the curriculum example and that is okay as long as the organization makes sense – EXAMPLE BELOW)**
    - Potential questions include:
        - What do you think big concept of today was? The one we will put in the center bubble?
        - What should we write inside this bubble? What should we add to this bubble?
        - Do we have any examples of that we should add to the bubble?
        - What is something that is connected to this concept?
        - What other bubbles do you think we should include on this concept map?
        - Is there anything else you think we should add to the concept map?
- (Once concept map is complete have students copy it into their science notebook on page xx.)

Example: Concept Map #2



Study Hall: (30 min)
Goal: Students learn how to build on an existing concept map with new information and learn a study skill which will help take their knowledge from KNOW to OWN.

- Preview Study Hall. Be sure to include:
  - Today we will have our first Study Hall.
  - Today we will work to take some of our knowledge and move from knowing (KNOW) it to owning (OWN) it.
- Now that we have completed our exploration of Invertebrates it is time to start owning that knowledge.
- Introduce Flash Cards. Be sure to include:
  - One way to get to owning knowledge is simply to memorize it. Memorizing knowledge allows us to recall it more easily and apply it to future learning.
  - One of the best ways to memorize knowledge is by using flash cards.
  - Flash cards are simply cards that have information on both sides.
  - The simplest flash cards have a word on one side and a definition on the other.
  - Flash cards can also have questions on one side and the answer on the other.
  - The most important rule to flash cards is they should only have <u>one question</u> per card.
  - Flash cards can also have sketches on them if that is helpful to you
- Create two example flash cards using the invertebrate concept map using mental modeling.
  - (Definition card) Invertebrate: an animal without a backbone
  - (Question card) Name three adaptations that help a rocky seashore animal survive.
    - Low profile
    - Large sticking area
    - Round body shape
  - (Pass out six index cards and have students create these two flash cards.)
- Work as a group to create 2-3 more flash cards together. Potential questions include:
  - What is something else from this concept map that we might want to memorize?
  - What is another question a teacher could ask us about invertebrates?
- (Once students have their five flash cards created have them silently study them for 3-5 minutes.)
  - Remind students to study flash cards BOTH ways.
- (In the last five minutes have students pair up and test each other with their flash cards.)
  - (Walk around and give every student a large paperclip)
- (Have students write their name on the final index card and place it on top of their pile of flashcards and paperclip them together.)
  - (Collect flash cards.)
  - (Let students know we will add to this pile.)

Thank You (15 min):
- (Gather all cohorts together.)
- (Team Lead pull aside students who are doing thank-you's and check in with them quickly and give them the mentor gift.)
- (Assistant Lead have all other students sit in the amphitheater.)
- (Have all mentors line-up facing sitting students.)
- (IPM choose a student to do the first thank you. Have them walk up and stand next to the mentor they are thanking but face the group to give their thank you & gift so that everyone can hear.)
- (Repeat the above until all mentors have been thanked.)

- (IPM – take a group picture.)
- (Have all students stand up and create a high-five tunnel for the mentors to walk through.)
- (When all mentors have cleared the tunnel have students grab their backpacks and walk back to the bus.)

Science Labs

Day 7- Birch Aquarium

Goals: Students are engaged in exciting science programming that prepares them to learn about fish adaptations while visiting the Birch Aquarium.

Timing:

Time	Activity	Schedule
45 minutes	Community Building	9:00 – 9:45AM
35 minutes	Drive to Birch Aquarium	9:45 – 10:20AM
70 minutes	Fish Morphology Lesson Free Exploration of Aquarium	10:20 – 11:30AM
30 minutes	Fish Concept Map Expansion & Study Hall #2	11:30 – 12:00PM
25 minutes	Lunch	12:00 – 12:25PM
35 minutes	Drive to Living Lab	12:25 – 1:00PM
60 minutes	PEN Program	1:00 – 2:00PM

Supplies:

- Whiteboard & Stand (1)
- Dry erase markers (2)
- Dry erase eraser (1)
- Index cards (10/student)
- Pens (1/student)
- Extra paper clips (20)
- Student flash cards (1 set/student)

Intensive Program Manager

- Greet and orient new mentors.
- Exchange phone numbers with all Team Leads and mentors before field trip.
- Make sure all drivers have directions to drop-off location/parking area.
- Check group into Birch Aquarium.
- Once at the Birch Aquarium determine an appropriate place to eat lunch outside.
- Take pictures with digital camera.
- Review with mentors their role for the day – take a group around the aquarium for Fish Morphology Lab and Free Exploration time
- Set up Birch Aquarium classroom for Concept Map Expansion & Study Hall.
- Set up whiteboard and draw previous fish concept map on whiteboard.

Set Up

- Make sure vans are filled with gas.
- Make sure all Team Leads have directions and parking information for Birch Aquarium

Teaching Notes for Team Lead

- During Chores & Announcements remind students what they need to bring for field trip tomorrow:
  - Hats
  - Sleeves
  - Water bottle
  - Sunglasses
  - Closed-toed shoes

Mentors

- During Fish Adaptations Lab:
  Goal: Students will create three sketches (2 bony fish and 1 shark), name the fish, the habitat the fish lives in and one adaptation it has.
  - You will have a group of 3-4 students for approximately 30 minutes.
  - Spend approximately:
    - 10 minutes at Shark Exhibit
    - 10 minutes on one side of Hall of Fishes
    - 10 minutes on the opposite side of Hall of Fishes
  - As you walk along with students pause occasionally to let them write/sketch. Potential questions include:
    - Which fish are you sketching?
    - Where does it live?
    - What kind of adaptation do you think this fish has? How does that help it to survive?
  - Once you have visited all three places and all students have their sketches/notes done you will have 20 minutes to explore the aquarium as a group.
  - The IPM will tell you where to bring the students when free exploration time is over.

Fish Adaptations Lab (60 min):

- Intro (10 min)
  - Introduce the idea that fish have different adaptations for living in different environments.
  - Introduce the activity:
    - (Working on pages xx-xx.)
    - Students will walk through the hall of fishes.
    - Goal is to sketch two different fish from two different tanks in the hall of fishes and one shark from the shark exhibit.
      - For each sketch write down:
        - Name of the fish/shark
        - Fish/shark habitat

        - One adaptation
            - You will have approximately 30 minutes in the hall of fishes and 20 minutes at the shark exhibit.
    - Once all students have completed their sketches/notes you will have 20 minutes of free time to explore the aquarium as a group.
        - ***IPM will tell you when and where to meet up after free exploration time for Study Hall.***
    - Questions?
    - (Have students open to pages xx-xx in science notebook.)
    - (Divide each group into three smaller groups (each group will be led by the team lead, scientist mentor or alumni mentor.
    - (Have 1/3 of groups start at Shark Exhibit 1/3 of groups start at one side of Hall of Fishes and 1/3 of group start at the opposite side the Hall of Fishes).

- Activity (30 min)
    - (Spend approximately 20 minutes at Shark Exhibit, 15 minutes on one side of Hall of Fishes and 15 minutes on the opposite side of Hall of Fishes.)

Free Exploration of Aquarium: (20 min)

- Let your group choose the areas of the aquarium they want to explore for the last 20 minutes
- Take your group to Study Hall location at appointed time.

Fish Concept Map Expansion & Study Hall: (30 min)
Goal: Students learn how to build on an existing concept map with new information and learn a study skill which will help take their knowledge from KNOW to OWN.

Concept Map Expansion (10 min)

- Review the concept and Mantra of Knowing and Owning your knowledge.
- Return to fish concept map.
    - (Have students open their science notebooks to the concept map they created about fish and the sketches and notes they made in their notebooks today.)
    - You have learned several things today about fish.
    - It is important to expand on a concept map with new things that you learn. Today we will add to this concept map together.
    - (Ask students questions to build on their existing concept map. As they have ideas to add – add them to the concept map.) (*See Example Concept Map Below*.) Potential questions include:
        - What new information do you want to add to this concept map about fish?
        - What should we write inside this bubble? What should we add to this bubble?
        - Do we have any examples of that we should add to the bubble?
        - What is something that is connected to this concept?
        - What other bubbles do you think we should include on this concept map?
        - Is there anything else you think we should add to the concept map?

Review concept of Study Hall (5 min)

- Today is our second Study Hall.

- Today we will work to take some of our knowledge and move from knowing (KNOW) it to owning (OWN) it.
- We now have a robust concept map that we can use to create new flash cards.
- Review Flash Cards. Be sure to include:
    - Memorizing knowledge allows us to recall it more easily and apply it to future learning.
    - One of the best ways to memorize knowledge is by using flash cards.
    - Flash cards are simply cards that have information on both sides.
    - The simplest flash cards have a word on one side and a definition on the other or a question on one side and the answer on the other.
    - The most important rule to flash cards is they should only have <u>one definition/question</u> per card.
    - Try to add drawings/sketches to our flash cards – drawings can be very helpful in triggering information.
- Create two example flash cards using the fish concept map using mental modeling.
    - (Definition card) Fish: A vertebrae that lives in water and has scales, fins and gills.
    - (Question card) Name three characteristics of a cartilaginous fish.
        - Gill slits
        - Oily liver
        - Cartilage skeleton
- Today you and a partner will work together to create at least four more flash cards.
    - Both of you will need to create a copy of the flash card so you both have it for your set.
    - We encourage you to make as many flash cards as you can in the time given.
- Questions?

<u>Create flash cards</u> (10 min)

- (Hand out 6 index cards to students.)
- (Give students 10 minutes to work.)
- (While students are working pass out their stacks of flash cards.)

<u>Study with flash cards independently</u> (5 min)

- Remind students to study flash cards BOTH ways.

Science Labs

Day 8- Field Trip Living Coast Discovery Center

Goal: Students are engaged in exciting science programming during a visit to Hubbs-SeaWorld Research Institute where they explore scientific careers and learn about current research being done to protect the fish they have been studying.

Timing:

Time	Activity	Schedule	Round Robin
35 minutes	Community Building	9:00 – 9:35AM	n/a
30 minutes	Drive to LCDC	9:35 – 10:05AM	n/a
40 minutes	Explore Aquariums & Meeting with Science Leader	10:05 – 10:45AM	Round Robin
5 minutes	Transition between activities	10:45 – 10:50AM	
40 minutes	Humans vs. Sharks & Shark and Ray Exhibit	10:50 – 11:30AM	
30 minutes	Conservation Message: Fish	11:30 – 12:00AM	n/a
30 minutes	Lunch	12:00 – 12:30PM	n/a
30 minutes	Drive to Living Lab	12:30 – 1:00PM	n/a
60 minutes	PEN Program	1:00 – 2:00PM	n/a

Supplies:

General

- Name badges (1/student)
- Curiosity cubes (1 set/student)
- Digital camera (1)

Conservation Message: Fish

- Construction paper (30 sheet cut in half/group)
- Magic Markers (3-4 sets/group)
- Assorted stickers/glitter glue/etc.
  - For decorating Conservation Tweets

Intensive Program Manager

- Exchange phone numbers with all Team Leads and mentors before field trip.
- Make sure all drivers have directions to drop-off location/parking area.
- Check group into Living Coast Discovery Center.
- Once at Living Coast determine an appropriate place to eat lunch outside and communicate to Team Leads.
- Take pictures with digital camera.
- Collect all Conservation Tweets at the end of the day to be put aside for Family Celebration night.

Set Up

- Make sure vans are filled with gas.
- Make sure all Team Leads have directions and parking information for Living Coast Discovery Center.

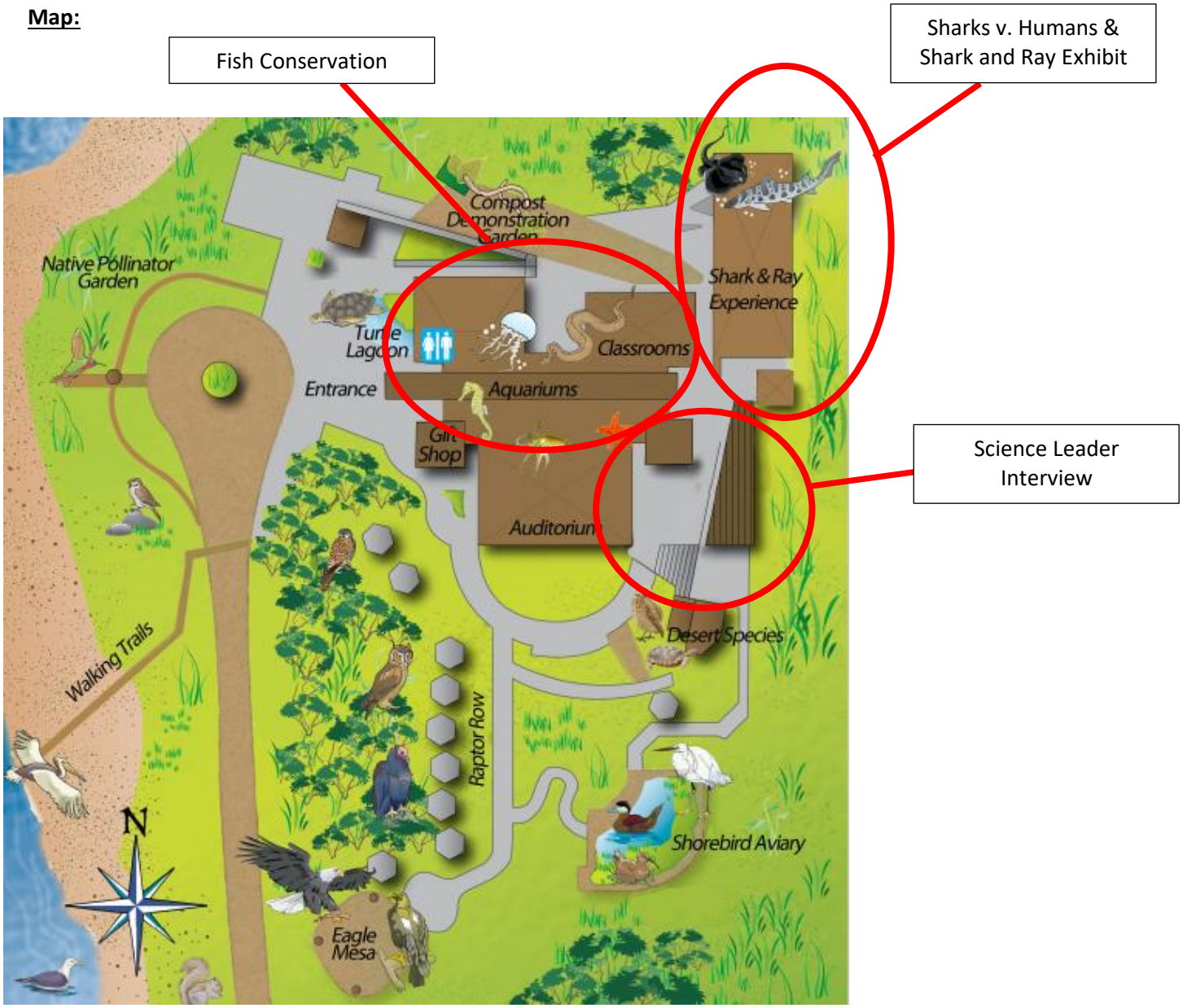
Teaching Notes for Team Lead

- N/A

Mentors

- Be sure there is at least one adult monitoring each table.
- Participate in all activities.
- During Conservation Message: Fish activity
    - Help students brainstorm ideas for a conservation tweet. Questions for them to consider:
        - What do you think is important for people to know about fish and sharks?
        - What do you want others to know about fish and shark conservation?
        - How could humans help protect fish and sharks?
        - Is there a concrete solution you can share?
    - Help students make sure their messages are not too long.

Map:


Fish Conservation
Sharks v. Humans & Shark and Ray Exhibit
Science Leader Interview
Compost Demonstration Garden
Native Pollinator Garden
Shark & Ray Experience
Turtle Lagoon
Classrooms
Entrance
Aquariums
Gift Shop
Auditorium
Walking Trails
Raptor Row
Desert Species
Shorebird Aviary
Eagle Mesa
N

<u>Explore Aquariums & Science Leader Interview</u> (40 min):

<u>Explore Aquariums</u> (20 min):

- Remind students that they have been studying fish the last few days.
- Today we will be focusing on how to protect fish and sharks.
- Discuss threats to fish:
    - Climate change
    - Pollution
    - Increased trash and plastics in the ocean
    - Overfishing
- We will have a chance to look at some local fish species here in San Diego and then afterwards meet with a science leader who will talk about how they are working to conserve fish and sharks.
- (Allow students to explore the Aquarium tanks.)

<u>Science Leader Interview</u> (20 min):

- Provide an overview of the Science Leader Interview.
    - Today we will focus on conservation and talk with a science leader who works helps conserve sharks and fish.
    - Will learn about their pathway to becoming a science leader and what they do in their work.
    - Will hear about their passion for protecting the organisms we have been studying.
    - You will have the opportunity to come to ask the scientist directly any questions you have.
        - Show students curiosity cubes.
        - Explain how they work and how students can use them during the interview.
- Introduce Science Leader.
    - Tell the students who they are about to meet (scientist's name) a scientist who (describe what they do in 1-2 sentences).
    - (Welcome the Science Leader.)
    - (Conduct the interaction as one would an interview.)
        - <u>Interview tips</u>:
            - You may wish to change the order or modify the questions based on the science leader's responses.
            - If a science leader is answering a question that may need to be wrapped up, you can move to the microphone which will signal them that you want to speak.
            - After the science leader answers a question, in a sentence or two, you can reaffirm the point they are making or acknowledge something about how it ties to the students' experience.
        - <u>Potential interview questions</u> (you do not need to use all):
            - Can you start by sharing more about yourself and how you came be the Science Leader you are today?
            - Can you share something that was challenging to you on your pathway to becoming a science leader and how you overcame this challenge?
            - We'd love to hear more about your work. Can you describe your work in a few sentences?
            - For the last few days, we have been studying sharks and bony fish. We are interested in what is being done to protect such important organisms. Can you tell us how your work helps to protect sharks and fish?

- I know you shared a bit about your job as a scientist, but were curious to learn one or two things you love about your job?
- What is one piece of advice you have for these future science leaders?
- Can you share one thing that you do, or your organization does that is really cool?

▪ Student questions:

- Give one or two students the chance to ask questions.
- If needed, remind them about the curiosity cubes.

Humans vs Sharks & Shark and Ray Exhibit (40 min):

Humans vs. Sharks Intro (20 min):

- Talk with students about how humans have impacted shark populations vs how sharks impact human populations. Potential facts to share:
  - Every year 600,000 to 700,000 tons of sharks are caught and killed.
    - On average about 100 million sharks per year, or 73,973 per day or 11,416 per hour, or 3 sharks per second, are killed!
  - Approximately 5-6 people are killed each year by sharks.
    - More people are killed in car accidents with deer, than are attacked by sharks!
    - Honeybees kill more people in the U.S. than sharks!
    - Domesticated pigs kill more people than sharks!
    - Airplane parts falling out of the sky kill more people than sharks!
    - More people are struck by lightening twice than attacked by sharks!
    - Most shark attacks are through mistaken identity, being provoked or threatened or territory defense.
  - (Discuss with students the concept of the reputation of sharks. Potential questions include:
    - Who should be afraid of who? Humans of sharks? Or Sharks of humans?
    - Why do you think sharks have such a bad reputation?
    - What do you think can be done to help change people's perception of sharks?
- Biggest Threats to Sharks
  - Shark populations in the world's oceans have declined by an "alarming" 71% since 1970, according to a study published in 2021, in the British journal Nature.
  - Finning: is the removal of a shark's fins while the rest of the shark is thrown back into the water to drown.
    - Shark fins are important ingredients in Asian foods. Shark fin soup has been a traditional Chinese delicacy for thousands of years, often served to signal wealth and honor.
    - Researchers found that 73 million sharks would have to be killed each year to match the volume of fins that are traded in the global market —a whopping 1 to 2 million tons.
  - Bycatch: is the accidental capture of non-target fish and other marine life and occurs in fisheries around the world.
    - Throughout the 1990s, fishermen captured 12 million sharks and rays as bycatch every year, just in international waters alone.
    - Shark species most at risk for bycatch include dusky sharks and scalloped hammerheads.

- It is estimated that dusky shark populations off the Atlantic coast declined by 85 percent.
- Scalloped hammerheads are extremely susceptible to fishing mortality due to their uniquely shaped and sensitive bodies.

▪ Longlines — made up of a mainline and hooks suspended in the water for several miles — catch sharks instead of the intended target at least 20 percent of the time, though it could be as high as 50 percent in Atlantic and Hawaiian fisheries.

- Every year 1,500 to 2,000 sharks are found trapped and usually dead in the shark nets protecting the South African Coast.
- Sharks reproduce slowly, which makes it harder for their populations to recover quickly when they are over fished.

- Ask students what they think should be done to help conserve sharks.

<u>Shark and Ray Exhibit</u> (20 min):
Goal: Students get an up close interaction with sharks to reinforce the idea that they are amazing creatures, with many incredible adaptations that should be protected.

- Explain to students that they will have the opportunity to interact with sharks in this exhibit.
- If they are comfortable, they can touch the sharks and rays.
  - Review two finger touch rule.
- Ask students to keep thinking about ways they can help to conserve sharks as future science leaders.

<u>Conservation Messages: Fish</u> (30 min):
Goal: Students will create a tweet about fish conservation that will be shared with their family and friends during the Family Celebration.

<u>Intro (10 min)</u>:

- Debrief the shark and fish conservation activities. Potential questions include:
  - What surprised you most about what heard about sharks?
  - How could humans help protect fish and sharks?
- As a science leader it is important to share what we know with others – particularly when it comes to conservation.
  - Soon we will have the opportunity to share what we know with our Family and Friends during Family Celebration night at the end of the program.
  - We will want to tell people why it's important to protect these organisms or how they can help protect these organisms.
    - Since we won't have a lot of time to share our conservation messages, we will need to make them, short-in the form of a tweet.
  - Review what a tweet is: a short message with 140 letters or less.
    - Example Tweet: Turn off your lights and turn down Climate Change!

<u>Brainstorm (10 min):</u>

- (Have students open to Fish Conservation page in their science notebooks.)
- We will use the next 10 minutes to brainstorm ideas about our conservation message. Things to consider when writing your tweet

  - What do you think is important for people to know about fish and sharks?
  - What do you want others to know about fish and shark conservation?
  - How could humans help protect fish and sharks?
  - Is there a concrete solution you can share?
- You will need to count your letters and make sure your message is no more than 140 characters!
- You can write as many messages as you want in your science notebook. They do not have to be perfect.
- (Give students five and two-minute warnings.)

<u>Write & Decorate Tweet for Conservation Tree (10 min):</u>

- Explain to students that they will pick their favorite conservation message tweet to share with everyone at the Family Celebration.
- They will write this tweet on piece of construction paper which will be hung from a large tree in the Plaza Del Sol the night of the Family Celebration where people can read their messages.
- After you have written you tweet feel free to decorate your paper.
- (Give students 5 minutes to work on conservation tweet.)
- (If time allows have a few students share their tweets.)
- (Collect all tweets to be hung on Conservation Tree later.)

Science Labs

Day 9

Goals: Students are engaged in exciting science programming that focuses on understanding what a marine mammal is and examples of marine mammals.

Supplies:

Marine Mammal Lecture & Concept Map #3

- White board + White board stand (1/group)
- Dry erase markers (2/group)
- Dry erase eraser (1/group)

Marine Mammal Mural

- Buckets of large chalk (3/group)
- Yard sticks (3/group)
- Marine Mammal cards
- Video camera (1)
- Tripod (1)

Office Hours:

- Laptop (1/student + 1/mentor + 1/team lead

Thank You's:

- Mentor thank you gifts (6)
- Digital camera (1)

Timing:

Time	Activity	Schedule
45 minutes	Community Building	9:00 – 9:45AM
30 minutes	Marine Mammal Lecture & Concept Map #3	9:45 – 10:15AM
75 minutes	Marine Mammal Mural	10:15 – 11:30AM
30 minutes	Office Hours #2	11:30 – 12:00PM
15 minutes	Thank You's	12:00 – 12:15PM
15 minutes	Chores & Announcements	12:15 – 12:30PM
25 minutes	Lunch	12:30 – 1:00PM
60 minutes	PEN Program	1:00 – 2:00PM

Intensive Program Manager

- Assign all Mentors to "Office Hours" locations.
  - Review the concept of "Office Hours" with mentors – they will have a group of 3-4 students they will be working with individually (see green box below).
- For Marine Mammal Mural:
  - Start/stop time-lapse video.
  - Create time-lapse video.
- For Thank You's:
  - Take Mentor Thank You photo.
  - Bring Mentor Thank You gifts.

Set Up

- For Marine Mammal Lecture & Concept Map #3:
  - Set up a whiteboard and stand near the SMART board.
  - Set up KNOW and OWN Knowledge Mantra Poster
- For Marine Mammal Mural:
  - Make sure no cars are parked on Plaza Del Sol.
  - In your science lab space have:
    - Marine Mammal Cards
    - Buckets of Chalk (3)
    - Yard sticks (3)
  - Set up video camera to capture the creation the Marine Mammal Mural.
- For Office Hours:
  - Set up laptops (1/student)
  - Make sure all laptops are open to Google Document "Office Hours Sign Up – Day 9"

Teaching Notes for Assistant Team Lead

- During Marine Mammal Lecture & Concept Map #3:
  - Help students who are struggling create a concept map during individual work time. Potential questions include:
    - What do you think the main concept is? What do you know about it?
    - What is another concept that is connected to this one?
    - How many bubbles should we put around this bubble? Why? What would each additional bubble say?
- During the SCL/Ocean Discovery Alumni Meeting:
  - Connect the zoom link(s).
    - Check sound.
    - Check that the camera shows as many students as possible.

Mentors

- Be sure there is at least one adult monitoring each table.
- Spread out amongst the students during all activities.
- Participate in all activities.
- For Ask Me What a Scientists Does T-shirt you have a **Mentoring Opportunity**:
    - While students are working talk to them about their ideas of what scientists do. Potential questions include:
        - What are some things not on the list that you think scientists do?
        - What do you think is something great about being a scientists?
        - Does being a scientist in the future interest you? Why or why not?
- During Office Hours:
    - You will have a group of 3-4 students for approximately 15 minutes.
    - Invite students to sit together at one table.
    - Welcome students to Office Hours.
    - Explain that this is a space for students to ask questions and clarify information.
    - Have a student share their question.
        - Remind students that their question(s) is written in their science notebook if they forgot.
        - When a student shares a question – do you best to answer it or have other students help to answer the question.
        - If it feels appropriate – have students add things to their concept map.
        - If you do not know the answer to a question, explain to students that you will not know the answer to every question but that you have resources such as the internet to find answers.
            - (Have students use laptops to research the answers – try to come to an answer as a group.)
    - During the last two minutes of office hours a musical cue will sound for everyone to return to their cohort.)
        - Be sure the space you are in is left exactly as you found it.
        - Take laptops back to original room.

Marine Mammal Lecture & Concept Map #3: (30 min)

Goal: Students practice how to take information from a lecture and organize it for understanding (KNOW) through building a concept map.

Intro: (5 min)

- Remind students of the concept of Knowing and Owning information. Be sure to cover:
  - Knowing (KNOW) – learning information through the development of concept maps and asking questions to solidify understanding
  - Owning (OWN) – memorizing, discussing, applying and teaching others about the knowledge they KNOW.
- Knowing how to learn and remember information from a lecture is an important skill we have practiced once and we will practice again today.
- Today we will have a slightly longer lecture and then we will work together to take the information and organize it into a concept map so we can use to remember what was taught – that is the (KNOW) part.

Lecture: (10 min)

- Have students take out their science notebooks and turn to page xx.
- Explain that students should take notes during the lecture. Tell students there will be two slides of notes today.
- (Give lecture.)
  - Marine Mammals
    - Definition: a mammal that lives in the ocean.
  - Characteristics of Marine Mammals:
    - Have hair (at some point in their life)
    - Breathe air through lungs
    - Give birth to live babies
    - Babies drink milk/mother's nurse
    - Warm blooded
  - Groups of Marine Mammals
    - (Show slide Marine Mammals in PowerPoint.)
    - Dolphins
    - Whales
    - Seals
    - Sea lions

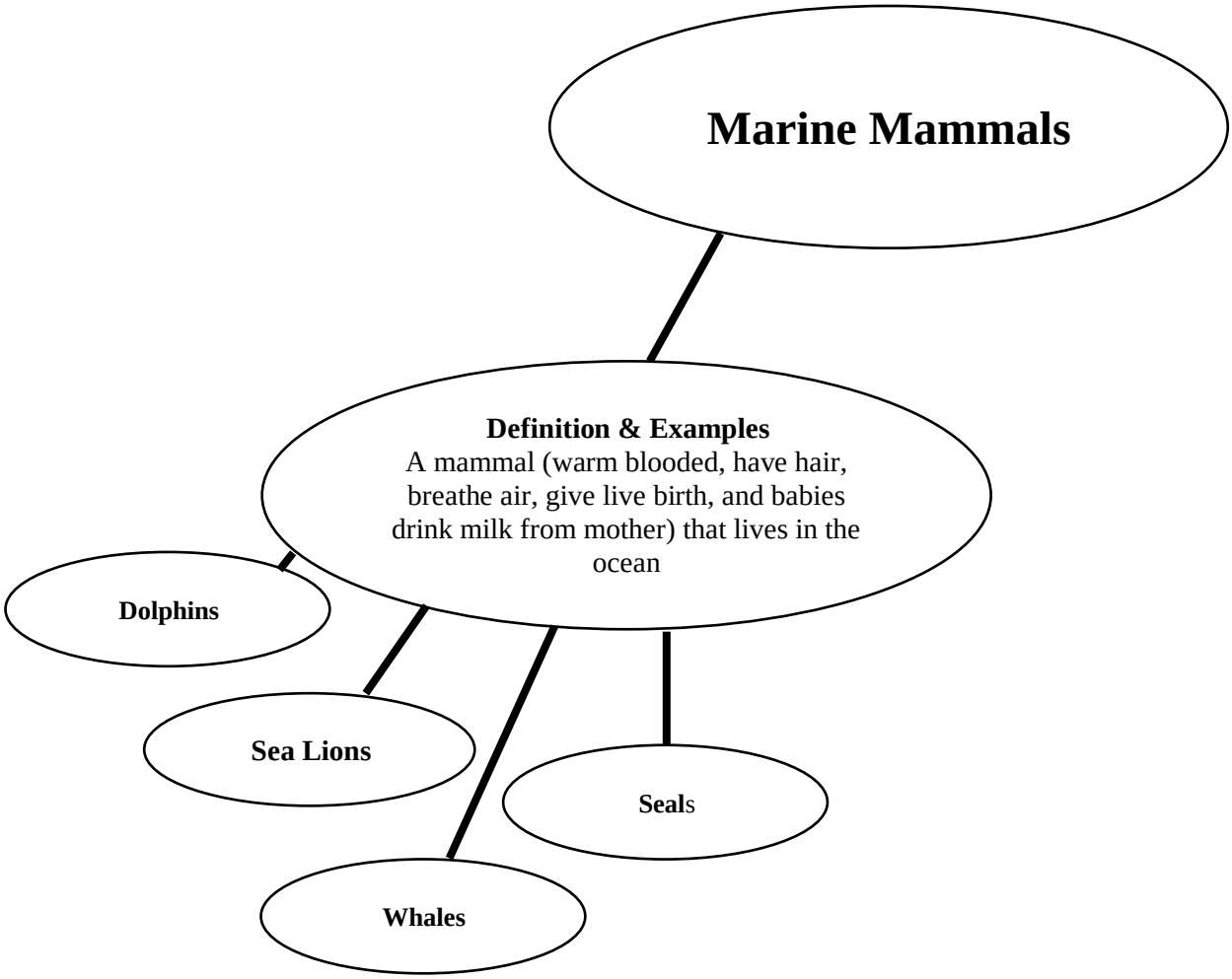
Build a Concept Map: (15 min)

- (Keep lecture slide up on the SMART board.)
- Review building a concept map. Be sure to cover:
  - Take the information that you wrote down during the lecture and organize it into a concept map.
  - Today you will attempt to build a concept map on your own – we will come together to compare concept maps after.
- Think-Pair-Share to create a concept map.
  - (Give students five minutes to work independently on concept map.)
  - Explain that students will not work with a partner to compare your concept maps. Be sure to cover:
    - Your concepts maps do NOT have to look exactly the same.

- One at a time, share your concept map with your partner and explain why you made it the way you did.
- If there is something you would like to add to your concept map after looking at your partners – please do so!
    - It is important to learn from others.

- (Pair students up and give them four minutes to share their concept maps and improve their own.)
- (Create a concept map on the white board by asking students questions.)
    - Remind students that their concept map may look different and that's okay.
    - (If time allows, create a second concept map that looks different from the first but conveys the same information.)

Example: Concept Map #3



Marine Mammal Mural (75 min):

- Intro (10 min)
    - Variety of shapes and sizes of marine mammals.
    - Many types of each: dolphins, whales, seals and sealions.
    - Today we will create a chalk mural representing the many different kinds of marine mammals that live off the California coast.
    - Chalk mural will be created by all cohorts together.
    - Each cohort will get 5-6 cards with a different marine mammals on them. It will be our job to draw those marine mammals with chalk on the ground in the Plaza Del Sol.
    - One important thing- our marine mammals must be drawn to real life size!
    - (Bring group together at one table and place marine mammal cards on the table.)

- Prepare for Chalk Mural (10 min)
    - (Allow students to look over cards.)
    - (Place tools on the desk.)
    - Explain that for each marine mammal:
        - Length will need to be measured using the yard sticks before drawing
        - Name of the marine mammal must be written somewhere inside the chalk drawing
        - One fact about their marine mammal.
        - Will be working with chalk so if you make a mistake- don't worry. You won't be able to erase it just do the best you can.
    - Their cohort is responsible for drawing all the animals given.
    - (Work as a group to decide who will draw which marine mammals.)
        - (Some are very large and will need two students to draw.)
    - (Once outside they will select a location for their marine mammal.)

- Create Chalk Mural (30 min)
    - (Start time-lapse video.)
    - (Work with all cohorts to spread students out to create the mural.)
        - (Consider placing the largest marine mammals first.)
    - (Have students start by measuring and marking the size area they need to create their picture.)
    - (Once the length of the marine mammal is marked -give students chalk pack to work.)
    - (If student finish early – have them work on helping others or adding to the underwater landscape.)

- Debrief (20 min)
    - Gather all students together around the mural.
    - Ask students to identify the following:
        - How many different marine mammals do they see?
        - What are some similarities? Differences?
        - Smallest marine mammal.
            - How large are they compared to a human?
        - Largest marine mammal.
            - How large are they compared to a human?

    - Play a review game. Every run to and stand on a:
        - Whale.

        - Discuss correct/incorrect answers after each one.
        - Marine mammal that has warm blood.
        - Marine Mammal that has a swim bladder.
        - Marine mammal that breathes air.
        - Marine mammal that is larger than a person.
        - Marine Mammal that has hair at some point in their life.
        - Marine Mammal that is about the same size as you.
        - Seal or sealion.
        - Marine Mammal that has a large sticking surface.
    - Ask students to share a fun fact about the marine mammals they drew.

Office Hours (30 min)

- Intro (5 min)
    - Review concept of office hours:
        - Part of college.
        - Time to meet with professors outside of class to clarify your understanding and ask questions.
        - Can be intimidating but professors WANT you to come.
        - If you have questions you should bring them to office hours but it is not necessary to have a question to go to office hours.
    - Today we will have our second office hours. You will choose an "office" to go to, and work with that instructor to answer any questions you have about what you learned over that last several days.
    - Remind students what they have done over the last several days.
        - Definition of a fish, fish adaptations and how to help conserve fish.
        - Definition of a marine mammals and examples of marine mammals.
    - Have students write down at least one question to ask in office hours.
        - (Show Question Sentence Starters slide on PPT.)
            - I want to know more about…
            - I'm confused about….
            - I wonder….
        - (Remind students they may have questions written down in their science notebooks.)
    - Give students 2-3 minutes to write down a question. Check that each student has at least one question.

- Office Hours Sign-up (5 min):
    - We will spread out during Office Hours so that we are in smaller groups and can more easily ask questions.
    - You may end up at an Office Hours with scientists from another cohort.
    - In order to make sure we don't have too many people in one space everyone will sign up an Office Hours location using a laptop.
    - You can choose to sign up for any location that has less than five people.
    - Once you have selected a location simply type your name into that box.
    - If you see that a box already has five names you will need to choose another location.
    - Questions?
    - (Allow students to open laptops and choose a location for Office Hours.)

- Office Hours Transition (3 min)

- (Play musical cue to throughout Living Lab to let all groups know it is time to move to their office hours location.)
- (Staff and students walk to Office Hour locations.)

- Office Hours (15 min)
  - (Invite students to sit together at one table.)
  - Welcome students to Office Hours.
  - Explain that this is a space for students to ask questions and clarify information.
  - Remind students that the question(s) they have is written in their science notebook if they forgot.
  - Go around the group and ask each student to share their question.
    - When a student shares a question – do you best to answer it or have other students help to answer the question.
    - If you do not know the answer to a question, explain to students that you will not know the answer to every question but that you have resources such as the internet to find answers.
      - (Have students use laptops to research the answers.)
  - (Last two minutes of office hours a musical cue will sound for everyone to return to their cohort.)
    - Be sure the space you are in is left exactly as you found it.
    - Take laptops back to original room.

Thank You (15 min):

- (Gather all cohorts together.)
- (Team Lead pull aside students who are doing thank-you's and check in with them quickly and give them the mentor gift.)
- (Assistant Lead have all other students sit in the amphitheater.)
- (Have all mentors line-up facing sitting students.)
- (PIM or Team Lead choose a student to do the first thank you. Have them walk up and stand next to the mentor they are thanking but face the group to give their thank you & gift so that everyone can hear.)
- (Repeat the above until all mentors have been thanked.)
- (IPM – take a group picture.)
- (Have all students stand up and create a high-five tunnel for the mentors to walk through.)
- (When all mentors have cleared the tunnel have students grab their backpacks and walk back to the bus.)

Science Labs

Day 10

Goals: Students are engaged in exciting science programming that focuses on understanding how marine mammal are adapted to live in their environment.

Timing:

Time	Activity	Schedule
45 minutes	Community Building	9:00 – 9:45AM
90 minutes	Marine Mammal Adaptation Science Labs	9:45 – 11:15AM
30 minutes	Marine Mammal Concept Map	11:15 – 11:45AM
30 minutes	Study Hall #3	11:45– 12:15PM
15 minutes	Chores	12:15 – 12:30PM
25 minutes	Lunch	12:30 – 1:00PM
60 minutes	PEN Program	1:00 – 2:00PM

Supplies:

- Feeding Frenzy
  - Square baking tins (15)
  - Plants from the canyon to represent fish and plankton
  - Brush (15)
  - Tongs (15)
  - Cups (1/student)
  - Picture of a toothed whale (15)
  - Picture of a baleen whale (15)
  - Towel (15)
  - White board + stand (3)
  - Dry erase marker (6)
  - Dry erase eraser (3)
  - Large digital timer (3)

- Seal and Sea Lion Races
  - Small orange cones (4/group)

- Study Hall
  - Student flash cards (1 set/student)
  - Index cards (10/student)
  - Spare large paperclips (10)

Visuals:

- Baleen Whale Feeding Video
- Seals vs. Sea Lions Video
- Sea Lion vocalization Video
- Dolphin video
- Dolphin Chasing Fish Video
- **c** KNOW and OWN Knowledge Mantra poster (1/group)

Intensive Program Manager

- Greet and orient new mentors.
- Introduce new mentors at Community Building during Announcements

Set Up

- For Concept Map and Lecture activity:
  - Set up a whiteboard and stand near the SMART board.
  - Hand up KNOW and OWN Knowledge Mantra poster.
  - Draw previous Concept Map #3 on the whiteboard.

- For Feeding Frenzy:
  - Load Baleen Whale feeding video. Advance past commercials and pause.
  - Discuss floor management plan with Assistant Team Lead and mentors.
  - For Feeding Frenzy:
    - Fill each mental tin up ½ way with water.
    - Place plants in mental tin to represent plankton and fish
    - Place both whale pictures, two cups, brush and tongs alongside each bin.
  - Write the results chart on the dry-erase board:

	Teeth	Baleen
Plankton		
Fish		

- For Seals vs. Sea Lions:
  - Load Seals vs. Sea Lions video
  - Load Sea Lion vocalization video
  - Set up racecourse with clearly defined start line and finish line using orange cones.

Teaching Notes for Team Lead

- N/A

Mentors

- Be sure there is at least one adult monitoring each table.
- Spread out amongst the students during all activities.
- Participate in all activities.
- During Feeding Frenzy you have a **Mentoring opportunity.**
  - Which type of food do you think your whale is going to be better at eating? Why?
  - Do you think your whale ever eats the other type of food? Why or why not?

Marine Mammal Adaptation Science Labs

Feeding Frenzy: Whale Adaptations: (40 min)
Goal: Students take part in an experiment to learn the different ways baleen and toothed whales are adapted for eating.

Intro: (5 min)

- Today we will focus on marine mammals and the different types of adaptations they have to survive.
- In this experiment you will be comparing baleen versus toothed whales.
    - (Show Baleen vs. Toothed Whales slide in PPT.)
    - Ask students to make observations between the two.
        - Baleen vs. Teeth
        - One blowhole vs. two blowhole
        - Size

Activity (25 min)

- (Pair up students sitting across from each other.)
- (Tell students not to touch anything until you explain the experiment to them.)
- (Place a set of activity tools in front of each pair of students.)
    - Place tray of water on top of towel
    - Place a cup in front of each student
    - Off to the side place both laminated pictures face down, the tongs and the brush.
- Tooth vs. Baleen Whale
    - Tell students to each take one of the laminated cards without looking at it.
    - Whichever picture you have tells you if you are a toothed or baleen whale.
    - (Ask a few students which type they are.)
    - (Hold up the tongs and the brush.)
        - Ask students which eating device they think belongs to each of the types of whale.
        - (Have students take the appropriate eating tool for their whale.)
- Plankton vs. Fish
    - Tell students that their whales have two choices of food:
        - plankton (just like we looked at in Catalina) – xx plants
        - fish – xx plants
- Hypothesis:
    - Explain to students that they are going to make a hypothesis and then test the hypothesis.
    - Define hypothesis: An educated guess.
    - Ask students to create a hypothesis about which type of food they think the baleen whale will be best at eating and what type of food the toothed whale will be best at eating. Be sure to have students explain their thinking.
    - (Write the general hypothesis on the SMART board.)
- Experiment:
    - Cup is their stomach put food in stomach.
    - Have 30 seconds to eat as much food as possible.
    - One rule: the ocean does not have walls so you can't use the edge of the tray to help you eat (demonstrate this).
    - Questions?

- (Put 30 seconds on digital timer.)
- (Start experiment.)

- Collect data:
  - (Have students count how much of eat type of food they ate.)
  - (Collect data from each group. Add amount of each type up with a calculator and write it in data box on white board.)
- Analyze data:
  - Ask students to analyze date. Potential questions include:
    - What does the data tell us?
    - Does the data support our hypothesis? Why or why not?

Debrief (10 min):

- Discuss some of the outliers with students. Potential questions include:
  - Do you think toothed whales sometime eat plankton? Why or why not?
    - Did our data support this idea? How can you tell?
  - What about our experiment doesn't accurately reflect how whales really eat? What could we do to further test our hypothesis?
- Discuss baleen whales:
  - Baleen whales are some of the largest animals on the planet – what surprises you about how they eat?
  - Watch Baleen feeding video (start at 1:56 and end at 3:30).
    - Ask students what observations they made about how baleen whales are able to eat so much food.

Break: (5 min)
If time allows give students a 5 minute bathroom break before beginning next activity.

Seal and Sea Lion Races: Pinniped Adaptations: (45 min)
Goal: Students take part in an experiment to learn the different ways seals and sealions are adapted for their environment.

Intro: (10 min)

- Look at more marine mammals – seals and sea lions.
- Both are pinnipeds:
  - Define: Pinna – feather ped – foot. "Feather-foot"
  - Habitat: land (shore) and ocean
- (Show Seals vs. Sea Lion slide on PPT.)
- Ask students to observe differences between seals and sea lions.
  - (Write down student responses on SMART board in a t-chart.)
  - Be sure to cover:
    - Size
    - Ears
    - Back flippers
    - Front flippers (optional)
  - Show video on Seals vs. Sea Lions

Activity (25min)

- Do some experiments to see which performs better seals or sea lions:
  - On land

  - In the ocean
- Hypothesis:
  - Have students create a hypothesis for each experiment. Be sure to have students explain their thinking.
  - (Write each hypothesis on the SMART board.)
  - (Divide students in half.)
    - One group are sea lions the other are seals.
- Experiment #1: Race on Land
  - Seals – run on hands and ankles crossed
  - Seal Lions – run on hands and knees uncrossed
  - (Have a mentor stand at the finish line for each team.)
    - As a student from one team crosses the finish line, they will wave their hand and the next student can start.
- Experiment #1: Collect & Analyze data.
  - Ask students which group was more successful on land? Why is that?
  - What adaptations do sea lions have to help them move more quickly on land?
    - Seal lions can rotate their hind flippers under their body to "walk" and seals can not they have to scoot along on their bellies.

- Experiment #2: Race in Ocean
  - Seals – run forward to the finish line (sleeker more streamlined bodies)
  - Sea Lions – run backwards to the finish line (bulkier less streamlined bodies)
  - (Have a mentor stand at finish line and signal when someone has crossed so the next student can go.)
- Experiment #2: Collect & Analyze data.
  - Ask students which group was more successful in the ocean? Why is that?
  - What adaptations do seals have to help them move more quickly in the ocean?
    - Seals have sleeker more streamlined bodies for moving more quickly through the water. Sea lions are bulkier and less streamlined.

<u>Debrief Seals vs. Sea Lions</u> (10 min):

- Create a table with students of adaptations for seals and sea lions. Be sure to include:

	Seals	**Sea Lion**
Body shape	Smaller and sleeker Better for water	Larger and bulkier
Front flippers	Short	Long Better for walking on land
Hind flippers	Do not rotate under body so scoots on land	Can rotate under body so "walks" on land Better for land
Vocalizations	Finding mates/babies Less social - spend less time in groups	Finding mates/babies Very social – spend time on land in large groups

- Play Sea Lion vocalization video
  - Ask students why loud vocalizations might be a helpful adaptation for Sea Lions?

Marine Mammal Concept Map Expansion: (30 min)

Concept Map Expansion Intro: (10 min)

- Review the concept and Mantra of Knowing and Owning your knowledge.
- Return to Marine Mammal concept map on page xx of Science Notebook.
    - You have learned more about marine mammals today.
    - It is important to expand on your concept map with new things that you learn.
    - Today you will work with a partner to expand your concept maps together.
- Concept Map Expansion
    - Explain to students they will have 10 minutes to work with a partner.
    - There are guiding questions on the board.
        - What new information do you want to add to this concept map about marine mammals?
        - What is something that is connected to this idea?
        - Is there anything else you think we should add to the concept map?
    - Instructor and Mentors will walk around to help and answer questions.
    - Goal is to add as much to your concept map as possible.

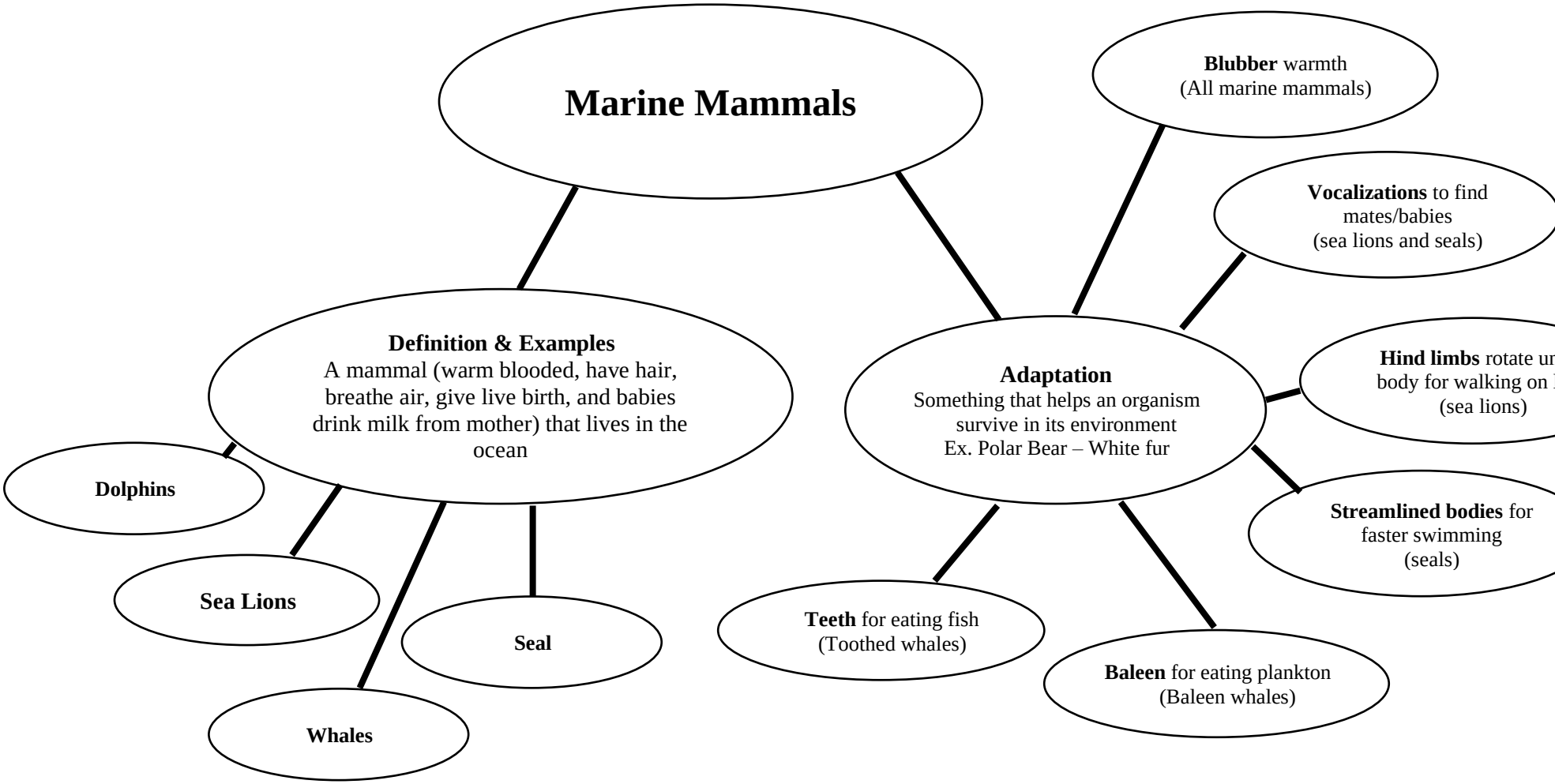
Activity: (10 min)

- Give students 10 minutes to work in pairs.

Debrief: (10 min)

- Do a whole group share out with Team Lead adding things students suggest to concept map at the front of the room.
- (*See Example Concept Map Below*.)

Example: Concept Map #3 Expanded



Study Hall: (30 min)

Intro (5 min)

- Preview Study Hall. Be sure to include:
    - Today is our third Study Hall where will take our marine mammal knowledge and move from knowing (KNOW) it to owning (OWN) it.
    - Today you will create your own set of flash cards based on what you know about marine mammals.
    - Your goal is to create 5-10 new flash cards. Remember:
        - Flash cards are simply cards have information on both sides.
        - The simplest flash cards have a word on one side and a definition on the other.
        - Flash cards can also have questions on one side and the answer on the other.
        - The most important rule to flash cards is they should only have one question per card.
        - Flash cards can also have sketches on them if that is helpful to you.

Create flash cards (10 min)

- (Hand out 10 index cards to students.)
- (Give students 8 minutes to work.)
- (While students are working pass out their stacks of flash cards.)

Study with flash cards independently (5 min)

- Remind students to study flash cards BOTH ways.

Study with a partner (10 min):

- Explain:
    - First have your partner test you with your OWN cards – students should be studying ALL flash cards not just marine mammal ones.
    - Then have your partner test you with THEIR cards.
        - Ask students why this would be a good idea?
- (Have students pair up with someone next to them and practice.)
- (In the last minute have students add new cards to their pile and paperclip.)
- (Collect student flash cards.)

Science Labs

Day 11

Goals: Students are engaged in exciting science programming that focuses on understanding marine mammal conservation and sharing that message with others.

Timing:

Time	Activity	Schedule
45 minutes	Community Building	9:00 – 9:45AM
30 minutes	Zoom Meeting with Science Leader	9:45 – 10:15AM
90 minutes	Genetics and Conservation Lab & Ask Me What a Science Leader Does T-shirt	10:15 – 11:45AM
30 minutes	Conservation Message: Marine Mammals	11:45 – 12:15PM
15 minutes	Chores & Announcements	12:15 – 12:30PM
30 minutes	Lunch	12:30 – 1:00PM
60 minutes	PEN Program	1:00 – 2:00PM

Supplies:

- Curiosity cards (1 set/student)

Zoom Meeting with Science Leader:

- SMART board (2)
- Speaker (2)
- Microphone (2)
- Microphone stand (2)
- Camera (2)
- Curiosity cubes (1 set/group)

For Genetics and Conservation Lab:

- E-Gel iBase Power System (1/ 2 students)
- E-Gel Safe Imager Real-time Transilluminator (1/2 students)
- E-Gel (1/2 students)
- Pipettes locked to 8ul (1/2 students)
- Disposable pipette tips (1/2 students)

Ask Me What a Science Leaders Does T-shirt:

- White t-shirt w/Ocean Discovery Logo on front corner pocket area (1/student + 1/mentor)
- "Ask Me What A Science Leader Does" stencil (2/group)
- Small plastic bins for art supplies (3/group)
- Stencils (a bunch/group)
- Brushes (1/student + 1/mentor)
- Fabric Paint
    - 4-5 bottles of different colors for each group of students
- Cardboard boxes (for stretching shirts over when painting) (1/student + 1/mentor)

- Fabric markers
    - 9 markers of different colors for each group of students
- Cup for rinsing brushes (4/group)
- Can of spray adhesive (1/group)
- Blank piece of paper (1/student + 1/mentor)
- Pencils (1/student + 1/mentor)

Conservation Message: Marine Mammals

- Construction paper (30 sheet cut in half/group)
- Magic Markers (3-4 sets/group)
- Assorted stickers/glitter glue/etc.
    - For decorating Conservation Tweets

Intensive Program Manager

- Collect all Conservation Tweets at the end of the day to be put aside for Family Celebration night.

Teaching Notes for Assistant Team Lead

- During Zoom Meeting with Science Leader:
  - Connect the zoom link(s).
    - Check sound.
    - Check that the camera shows as many students as possible.

Set Up

- For Genetics and Conservation Lab:
  - See below directions: Gel Electrophoresis Instructions
  - **Make sure there is one good "sample" e-gel with all the plankton DNA run clearly so that students can look at that sample if theirs is not clear.***
- For Zoom Meeting with Science Leader:
  - Set up technology and test for Zoom call with SCL.
    - Connect a speaker, microphone, microphone stand, and camera.
  - Have a set of curiosity cards available for your group.
- For Ask Me What a Science Leader Does T-shirt:
  - Set to the side: t-shirts and cardboard boxes (1/student + 1/mentor)
  - Set to the side: blank piece of paper and a pencil (1/student + 1/mentor)
  - Set to the side can of spray adhesive
  - Fill cups halfway with water and set to the side
  - Divide art supplies evenly into small plastic bins:
    - Fabric markers
    - Fabric paint
    - Stencils
    - Brushes
  - Determine a location to place drying t-shirts.

Mentors

- Be sure there is at least one adult monitoring each table.
- Participate in all activities.
- During the Genetics and Conservation Lab:
  - Help students to use micropipettes and load DNA into e-gels
  - Be sure students are loading the correct DNA into each well.
  - Be sure all students are taking a turn using the micropipette.
- For Ask Me What a Science Leader Does T-shirt:
  - Help students design shirts.
  - Help with laying and gluing stencils down on shirts.
- During Conservation Message: Marine Mammals activity
  - Help students brainstorm ideas for a conservation tweet. Questions for them to consider:
    - What do you think is important for people to know about marine mammals?
    - What do you think is important for people to know about protecting marine mammals?
    - How could humans help protect marine mammals?
    - Is there a concrete solution you can share?
  - Help students make sure their messages are not too long.

Gel Electrophoresis Instructions

Using the E-Gel iBase Power System and Transilluminator

Materials: E-Gel iBase Power System
E-Gel Safe Imager Real-time Transilluminator
E-Gel
Pipettes locked to 8ul
Disposable pipette tips
5 types of DNA

Set Up

Before Students arrive (gels must be pre-run)

1. Mount the E-Gel iBase on the E-gel Safe Imager
2. Attach the short electrical cord from the Imager to the iBase.
3. Attach the power cord to the imager (don't plug it into the wall yet)
4. Slide the E-Gel into the designated spot on the iBase. (it will snap into place)
5. Plug the power cord into the outlet (the LED light will be red)
6. Select the program **PRE-RUN 2min** and press the **GO** button.

   To change programs, press the mode key, the program name will begin to flash, then use the arrow keys to switch between programs. To change the amount of time to run a gel hit the mode key until the minutes start to flash, then change the time using the arrow keys.

7. The LED light will change to green to indicate the pre-run mode, and after two minutes will stop automatically. (indicated by a red light and beeping sound)
8. Select the program to run the gel (Run E-Gel 26 minutes).
9. Finally remove the comb and the gel will be ready for the students.

With the Students

1. Make sure all the power is off.
2. Once the students have learned how to use the pipettes, they may pipette the DNA into the wells, using a new disposable tip for each sample.
3. Once all the wells are full place the protective amber shield over the iBase (it should fit snuggly into place)
4. Now it is safe to plug in the machine and 'run the gel'
5. The screen should already be set to "Run E-Gel" for 26 minutes
6. Press the red "Go" button to start the gel, a green light will indicate the gel is running.
7. To stop the gel at any time, press the "Go" button (the stopped current is indicated by a flashing red light) then to continue or reset follow the directions on the screen.
8. To watch the gels run or check on their progress press the red button on the transilluminator. (This should not be kept on the entire time)
9. When the gel is finished running the light will turn flashing red and there will be continuous beeping for 30 seconds, followed by a single beep every minute.
10. To finish the process press "Go". You can now continue to study the results with the transilluminator or proceed to the "clean up" instructions.

Clean up

1. Disconnect the power cord and take apart all pieces.
2. Remove the gel from the iBase by simply sliding the gel out the opposite way it was put in.

3. These gels are non-toxic and can be thrown away in the trash.
4. Store all left over gels and equipment at room temperature.

<u>Zoom Meeting with Science Leader</u> (20 min):

- Today we will be focusing on conservation of marine mammals.
    - Review what students have learned about marine mammals over the last two days.
    - Now that we know so much about marine mammals it is important as science leaders to think about how we can help protect them.
    - Review the definition of conservation: careful protection of something.
- Marine Mammals of all types are threatened by many things such as:
    - Rising ocean temperatures
    - Increased trash and plastics in our oceans
    - Increased noise pollution
    - Ship strikes
    - Illegal hunting
- Today we will have the opportunity to talk to a science leader who is working in the field of marine mammal conservation, we will participate in a DNA lab to see how genetics can be used to help conserve marine mammals, and we will create a final tweet to be hung in the conservation tree tomorrow night.
- Today we will meet with a science leader Marlem who is also an Ocean Discovery Alumni.
    - Marlem participated in the Ocean Leader Bridge program just like you are doing.
    - She will tell you a bit about her pathway, her current job, her work with genetics and marine mammals and then you will have the opportunity to ask questions.
        - (Pass out curiosity cards.)
        - You can ask one of these questions or your own question.
- Introduce Science Leader.
    - Tell the students who they are about to meet (scientist's name) a scientist who (describe what they do in 1-2 sentences).
    - (Connect Zoom Call).
    - (Welcome the Science Leader.)
    - (Conduct the interaction as one would an interview.)
        - <u>Interview tips</u>:
            - You may wish to change the order or modify the questions based on the science leader's responses.
            - If a science leader is answering a question that may need to be wrapped up, you can move to the microphone which will signal them that you want to speak.
            - After the science leader answers a question, in a sentence or two, you can reaffirm the point they are making or acknowledge something about how it ties to the students' experience.
        - <u>Potential interview questions</u> (you do not need to use all):
            - Can you start by sharing more about yourself and how you came be the Science Leader you are today?
            - Can you tell us about your experience at Ocean Discovery? How did it help you get to where you are today?
            - Can you share something that was challenging to you on your pathway to becoming a science leader and how you overcame this challenge?
            - We've seen you published a paper on bottle-nose dolphins – it was part of our scavenger hunt on our second day at the Living Lab. Can you tell us about the research you did?

- For the last few days, we have been studying marine mammals. We are interested in what is being done to protect such important organisms. Can you tell us how your research or work helps to protect marine mammals?
- What is one piece of advice you have for these future science leaders?

▪ Student questions:

- Give one or two students the chance to ask questions.
- If needed, remind them about the curiosity cubes.

○ (Have students say, "Thank you!" and clap for Marlem.)
○ (Disconnect Zoom call.)

Genetics and Conservation Lab (45 min):

Genetics & Conservation Intro (15 min):

- Introduction to Genetics. Be sure to cover:
  - Genetics is the study of inherited characteristics.
  - You inherit your characteristics through your DNA.
  - What is DNA?
    - (Use DNA slide on Ocean Leader Bridge PowerPoint.)
    - Every living thing has DNA.
    - DNA is microscopic and is found in every single cell in a living thing's body.
    - Every living thing has different DNA so it can be used like a fingerprint to identify them.
    - That means all scientists need is a single cell in order to be able to identify a living organism – IF scientists have already sequenced another living thing of that type.
      - For example: if scientists collect a water sample and find some skin they can analyze the DNA in that skin and check it against the catalogue of marine mammal DNA sequences to determine what kind of marine mammal the skin came from.
    - Genome catalogs are being created by scientists so that eventually all species of marine mammals can be identified by their DNA.
      - That is what Marlem was working with Illumia on – creating the genetic sequence for bottle nose dolphins.
- DNA in Conservation
  - Whales are a protected species.
  - In the past, whaling was a way of life for people around the world. Whales provided meat and blubber as a food source, oil was used for lamps, bones for tools, etc.
  - For a long time whaling didn't have an impact on whale populations because it took so much effort to go out in small boats and kill a whale.
  - However, in the 1700's and 1800's that changed as humans became much more efficient at whaling through the creation of larger, faster and more reliable boats and more advanced weapons such as gun-loaded harpoons.
  - This caused a dramatic decline in whale populations with several species on the brink of extinction.
  - In 1986 the International Whaling Commission banned commercial whaling in order to protect whale species and allow their populations to grow again.

- While some populations of whale are recovered there are still some that are endangered such as the North Pacific Right Whale, Sei Whale, Blue Whale, and Western Grey Whale.

DNA Lab (20 min):

- DNA Lab Introduction: (5 min):
  - Recently a NOAA research vessel was off the coast of San Diego and took water samples. Skin from what is believed to be a marine mammal was found in one of the water samples. We are interested in knowing if the skin belongs to any of the above endangered whale species.
    - (Show Endangered Whale DNA slide in Ocean Leader Bridge PowerPoint.)
  - We have a sample of DNA from the mystery marine mammal skin.
    - (Show DNA vial.)
  - We also have DNA samples from the four different types of endangered whales: North Pacific Right Whale, Sei Whale, Blue Whale, and Western Grey Whale.
    - (Show other vials of DNA.)
  - Our job is to figure out if the unknown skin DNA belongs to any of these endangered species.
  - Can we tell which is which just by looking at these vials of DNA?
    DNA is microscopic. We need a special machine to take the DNA and convert it to a visible code we can look at.

- Gel Electrophoresis machines & E-gels: (5 min):
  - These machines will help us to do that.
    - (Show gel electrophoresis machines.)
  - Place a small sample of each endangered species DNA and the unknown skin DNA into a gel so we can compare them and find a match.
    - (Show e-gel.)
  - Make sure you put only one organism's DNA into each hole so you can see each endangered whale species DNA and the unknown skin DNA separately and then compare them.
    - There are 12 holes, but we only need to use the first six.
    - Load the endangered species DNA samples into wells 1-4 and the mystery skin DNA into well 5 and 6.
      - (Show Loading E-gel slide in PPT.)
  - The holes in the gel are really tiny and we only need a very small amount of DNA so we will use micropipettes.
  - (Hold up micropipette and demonstrate how to use it.)
  - Be sure everyone gets a turn using the micropipette and loading DNA into at least one hole.
  - Once your gel is loaded, we will turn the machines on and let them process the DNA and turn it into a something visible we can compare.

- Loading Gels & Turning on Machines (10 min):
  - (Walk around and help students load gels. Help them place the tips into the wells. This can be difficult at it requires strong motor coordination.)
  - (Once a gel is loaded choose the e-Gel program to run and place the Safe Imager Real-time Transilluminator cover over the machine.)
  - (**Make sure the electrophoresis machine is set to the correct program: xx**.)
  - (Have the student's push the button to start the program.)

- (Tell students not to take the cover off while the machine is running- the light can damage their eyes.)
- (Show them where the light it so they can see the gel beginning to run with the cover on.)
- (**Collect all DNA samples and place in refrigerator**.)
- (Let machine's run while having students do Ask Me What a Science Leader Does T-shirt.)

Genetics & Conservation Lab Analysis (10 min):

Teaching Note: This will be done after making t-shirts.

Teaching note: Not all gels will be easy to read because students will over or underfill the wells in their e-gel. Allow students to look at the sample e-gel or another group's e-gel if theirs is unclear or to streaky to read.

- Return to e-gels.
- (Ask students to turn on light and look through Safe Imager Real-time Transilluminator cover and see their completed gels.)
  - Remind students that they are trying to figure out if the mystery skin DNA matches any of the endangered species DNA.
  - Remind students that the match will not be perfect because all living things have different DNA but the DNA should be very close because they would be from the same species.
  - (Give students 2-3 minutes to consider the question and talk with mentors or their partner.)
- Bring the group together again and have them share out their responses. Ask them what scientific evidence they are using to make their decision.
  - DNA can be used to identify organisms.
  - You can see the Blue Whale DNA is almost the same as the mystery skin DNA.
  - This means that an endangered Blue Whale was swimming off the coast of San Diego.
- Ask students how they think this information can be used by scientist to help conserve marine mammals?
- If time allows discuss that genetic sequencing has advanced from what we just did and is now done much more quickly using automated machines and computers.
  - Show Illumina video (fast forward to 2:10-2:35 in video)
- If time allows share other threats to marine mammals and ask students how genetics can be used to help conserve marine mammals.
  - Ship strikes
  - Noise pollution

Ask Me What a Science Leader Does T-shirt: (45 min)

Goal: Students consider the vast array of things science leaders do and become influencers by sharing their knowledge with the wider world through the creation of a t-shirt.

Intro: (10 min)

- Introduce the idea that science leader means a lot of different things and can look very different from leader to leader.
- Have students brainstorm the question: What do science leaders do?
  - Have students get broad and specific (you want lots and lots of answers).
  - (Write student responses on SMART board.)
- Ask student why they think creating a t-shirt like this is important?

Draft shirt (10 min):

- Explain that students will have 10 minutes to sketch the design they want on the back of their t-shirt.
    - (Students are only designing the back because we don't have time to let shirts dry and turn them over for painting on both sides.)
- Show students tools they will have available to them to create their t-shirt.
    - Brainstormed list (you can choose which ones you want to put on your shirt)
    - "Ask Me What a Science Leader Does" stencils
    - Optional stencils with pictures and designs.
    - Fabric markers for writing/drawing free hand
- Give students 8-10 minutes to work on their design.

Painting Shirts (20 min)

- Provide each student with a t-shirt and a box.
- Do not remove box from under shirt until it is completely dry – later today.
- (Demonstrate how to gently stretch shirt over box so that you have a flat area to paint.)
- Explain that Assistant Team Lead will have a can of spray adhesive if you want them to glue your stencil down.
    - Prevents it from slipping.
    - Will not damage shirt.
    - (Assistant team lead- spray VERY lightly onto stencil- let is dry about 30-60 seconds then let student place stencil on shirt.)
- Everyone can use the "Ask Me What a Science Leader Does" stencil at different times.
- Give students 10-, 5- and 2- minute warnings.

Clean-Up/Dry Shirts (5 min)

- Have students place t-shirts off to the side for drying-do not remove boxes.
- Have students clean brushes and place all used stencils in the sink.
- Have students place all unused stencils back in art bins.
- Have students make sure all fabric markers are capped and placed inside art bins.
- Have students make sure all fabric paint is capped and placed inside art bins.

Conservation Messages: Marine Mammals (30 min):

Goal: Students will create a tweet about marine mammal conservation that will be shared with their family and friends during the Family Celebration.

Intro (10 min):

- Remind students about the many threats that face marine mammals.
    - Rising ocean temperatures
    - Increased trash and plastics in our oceans
    - Increased noise pollution
    - Ship strikes
    - Illegal hunting
- Potential questions include:
    - What do you think is important for people to know about marine mammals?
    - What do you think is important for people to know about protecting marine mammals?
    - How could humans help protect marine mammals?

    - Is there a concrete solution you can share?
- As a science leader it is important to share what we know with others – particularly when it comes to conservation.
    - Soon we will have the opportunity to share what we know with our Family and Friends during Family Celebration night at the end of the program.
    - We will want to tell people why it's important to protect these organisms or how they can help protect these organisms.
        - Since we won't have a lot of time to share our conservation messages, we will need to make them, short-in the form of a tweet.
    - Review what a tweet is: a short message with 140 letters or less.
        - Example Tweet: Turn off your lights and turn down Climate Change!

<u>Brainstorm (10 min):</u>

- (Have students open to Fish Conservation page in their science notebooks.)
- We will use the next 10 minutes to brainstorm ideas about our conservation message. Things to consider when writing your tweet
    - What do you think is important for people to know about marine mammals? Threats to marine mammals?
    - What do you want others to know about marine mammal conservation?
    - Is there a concrete solution you can share?
- You will need to count your letters and make sure your message is no more than 140 characters!
- You can write as many messages as you want in your science notebook. They do not have to be perfect.
- (Give students five and two-minute warnings.)

<u>Write & Decorate Tweet for Conservation Tree (10 min):</u>

- Explain to students that they will pick their favorite conservation message tweet to share with everyone at the Family Celebration.
- They will write this tweet on piece of construction paper which will be hung from a large tree in the Plaza Del Sol the night of the Family Celebration where people can read their messages.
- After you have written you tweet feel free to decorate your paper.
- (Give students 5 minutes to work on conservation tweet.)
- (If time allows have a few students share their tweets.)
- (Collect all tweets to be hung on Conservation Tree later.)

<u>Family Celebration Intro</u> (5 min):

- Tomorrow night will the Family Celebration.
- A time for you to share all the experiences you have had the last two weeks with your family.
- One way we will do this is to share an activity we have done and allow your family to try the same activity.
- Each group will share one activity.
- Today we will vote on the activity we want to present to the families and tomorrow we will practice so that we are ready to present.
- (Share activity options on SMART board.)
- (Have student vote on which they want to do and then have them vote on a back-up activity in case another group chooses the same activity.)

Science Labs

Day 12

Goals: Students prepare for their practical and to share their Bridge Program experience with their family.

Timing:

Time	Activity	Schedule
45 minutes	Community Building	9:00 – 9:45AM
30 minutes	Office Hours #3	9:45 – 10:15AM
30 minutes	Study Hall #4	10:15 – 10:45AM
30 minutes	I AM Poems	10:45 – 11:15AM
45 minutes	Practical & Believe Survey	11:15 – 12:00PM
15 minutes	Thank You's	12:00 – 12:15PM
15 minutes	Chores & Announcements	12:15 – 12:30PM
25 minutes	Lunch	12:30 – 1:00PM
60 minutes	PEN Reflection	1:00 – 2:00PM
60 minutes	Prep for Family Celebration	2:00 – 3:00PM
150 minutes	Students dismissed	3:00 – 5:30PM
90 minutes	Family Celebration	5:30 – 6:30PM

Supplies:

- Office Hours
  - Laptop (1/student + 1/mentor + 1/team lead
- Study Hall
  - Study flash card piles (1 set/student)
  - Index cards (7/student)
  - Spare large paperclips (10)
- Practical
  - Copy of Practical exam (1/student)
  - Pencils (1/student)
- Thank You's:
  - Mentor thank you gifts (6)
  - Digital camera (1)
- Prep for Family Celebration
  - Family activity supplies (varies for each group)
  - Conservation Tree
    - Large made out of several piece of butcher paper taped to wall in Plaza Del Sol
    - Print out of paper hands
    - Scissors (5)

- Laminated 8x11 Photographs of Invertebrates (4)
- Laminated 8x11 Photographs of Fish (4)
- Laminated 8x11 Photographs of Marine Mammals (4)
- Construction Paper Hash Tags created by Ocean Leaders from Invertebrate, Fish and Marine Mammal Conservation Labs.

Intensive Program Manager

- Create slide show for Family Celebration.
- Assign all Mentors to "Office Hours" locations.
  - Review the concept of "Office Hours" with mentors – they will have a group of 3-4 students they will be working with individually (see green box below).
- For Thank You's:
  - Take Mentor Thank You photo.
  - Bring Mentor Thank You gifts.

Set Up

- For Office Hours:
  - Set up laptops (1/student)
  - Make sure all laptops are open to Google Document "Office Hours Sign Up – Day 12"

Mentors

- Be sure there is at least one adult monitoring each table.
- Spread out amongst the students during all activities.
- Participate in all activities.
- During Office Hours:
  - You will have a group of 3-4 students for approximately 15 minutes.
  - Invite students to sit together at one table.
  - Welcome students to Office Hours.
  - Explain that this is a space for students to ask questions and clarify information.
  - Have a student share their question.
    - Remind students that their question(s) is written in their science notebook if they forgot.
    - When a student shares a question – do you best to answer it or have other students help to answer the question.
    - If it feels appropriate – have students add things to their concept map.
    - If you do not know the answer to a question, explain to students that you will not know the answer to every question but that you have resources such as the internet to find answers.
      - (Have students use laptops to research the answers – try to come to an answer as a group.)
  - During the last two minutes of office hours a musical cue will sound for everyone to return to their cohort.)
    - Be sure the space you are in is left exactly as you found it.
    - Take laptops back to original room.

Office Hours (30 min)

- Intro (5 min)
    - Last Office Hours before your practical. Final opportunity for clarification of any subject you have.
    - You will choose an "office" to go to, and work with that instructor to answer any questions you have about what you learned over that last two weeks.
    - Remind students what they have done over the two weeks, studied:
        - Invertebrates
        - Fish
        - Marine mammals
    - Have students write down at least one question to ask in office hours.
        - (Show Question Sentence Starters slide on PPT.)
            - I want to know more about…
            - I'm confused about….
            - I wonder….
        - (Remind students they may have questions written down in their science notebooks.)
    - Give students 2-3 minutes to write down a question. Check that each student has at least one question.

- Office Hours Sign-up (5 min):
    - Remind students that three people is the maximum allowed in any Office Hours space.
    - (Allow students to open laptops and choose a location for Office Hours.)

- Office Hours Transition (3 min)
    - (Play musical cue to throughout Living Lab to let all groups know it is time to move to their office hours location.)
    - (Staff and students walk to Office Hour locations.)

- Office Hours (15 min)
    - (Invite students to sit together at one table.)
    - Welcome students to Office Hours.
    - Explain that this is a space for students to ask questions and clarify information.
    - Go around the group and ask each student to share their question.
        - When a student shares a question – do you best to answer it or have other students help to answer the question.
        - If you do not know the answer to a question, explain to students that you will not know the answer to every question but that you have resources such as the internet to find answers.
            - (Have students use laptops to research the answers.)
    - (Last two minutes of office hours a musical cue will sound for everyone to return to their cohort.)
        - Be sure the space you are in is left exactly as you found it.
        - Take laptops back to original room.

Study Hall: (30 min)

Intro (10 min)

- Flesh out marine mammal concept map
    - (Have students open to page xx in science notebooks to add to their marine mammal concept map.)
    - (Ask students questions if there is anything they want to add to their existing concept map. As they have ideas to add – add them to the concept map.) Potential questions include:
        - What new information do you want to add to this concept map about marine mammals after visiting NOAA Southwest Fisheries Science Center?
        - What should we write inside this bubble? What should we add to this bubble?
        - Is there anything else you think we should add to the concept map?
- Preview Study Hall. Be sure to include:
    - Today is our final Study Hall where you go from knowing (KNOW) to owning (OWN) your knowledge.
    - Your goal is to create 3-5 new flash cards. Remember:
        - Flash cards are simply cards have information on both sides.
        - The simplest flash cards have a word on one side and a definition on the other.
        - Flash cards can also have questions on one side and the answer on the other.
        - The most important rule to flash cards is they should only have one question per card.
        - Flash cards can also have sketches on them if that is helpful to you.

Create flash cards (5 min)

- (Hand out 5 index cards to students.)
- (Give students 5 minutes to work.)
- (While students are working pass out their stacks of flash cards.)

Study with flash cards independently (5 min)

- Remind students to study flash cards BOTH ways.

Study with a partner (10 min):

- Explain:
    - First have your partner test you with your OWN cards – students should be studying ALL flash cards not just marine mammal ones.
    - Then have your partner test you with THEIR cards.
        - Ask students why this would be a good idea?
- (Have students pair up with someone next to them and practice.)
- (If time allows have students switch partners and study with someone new.)
- (In the last minute have students add new cards to their pile and paperclip.)
- (Collect student flash cards.)

I AM Poems (30 min)
Goal: Students take time to reflect and express their beliefs and who they are as a person though a poem.

Intro (5 min):

- Students have had many experiences in the last few days which complement the thousands of experiences they have had in their lives.
- Experiences help make them the person they are.
- It is important to take time out every now and then to reflect and think about who they are as a person.
- They will be writing an I Am… Poem. This poem focuses on them and who they are.
- The only rule about writing this poem is that every line must be filled in.
- The rest is up to their interpretation, but they are welcome to include statements about where they're from regionally, ethnically, religiously, etc., memories from different points in their lives, interests and hobbies, mottos or credos, favorite phrases, family traditions and customs, and whatever else defines who they are.
- Let students know that they will be sharing their poems with the group and with their families tomorrow night.
- (Go through the first 2-3 lines using yourself as an example.)
    - Remind student that this is just a suggestion.
- The focus is on creating a poem that expresses who they are right now.
- Questions?

I Am… Poem (15 min)

- (Have students open to I Am poem on page xx in their science notebook)
- (Let student have 15-20 minutes of uninterrupted time to write.)
- (Play soft music.)
- (Staff can circulate and quietly check in with any students who are struggling.)

Debrief (10 min)

- (Have students pair up to share their I Am Poems.)
    - Remind students that they are being vulnerable, and it is important to be respectful and supportive.
    - Ask students to share something that they liked about their partners poem when they are done.
- (Ask students to share their poems with the group.)
    - (Ask those students to come to the front of the room.)
    - (Create a very supportive atmosphere for students who share.)
        - (Give "snaps" when a student is finished to create a jazzy/coffee house feel.)

Practical & Believe Survey (45 min):
**Teaching Note: This is a good time for a bathroom/water break to transition from the nature of I Am Poems to the Practical Exam. Consider playing some upbeat music during the transition.*

Intro (5 min):

- Welcome students to their practical exam.

- All feelings are valid (anxious, excited, nervous, calm, etc.)
- In addition to those feelings everyone in this room should feel prepared.
- Remind students that they have done a lot to prepare for this, attended lectures, created concept maps, attended office hours and study hall, created flash cards and studied with flash cards and other people's flash cards.
- This is how you want to show up for tests in high school in college – prepared!
- Explain the format of the practical.
    - Short answer and multiple-choice questions.
    - Read questions carefully! Some may want you to choose more than one answer.
    - You will have 20 minutes to work.
    - If you finish early – check your work!
- If you forget something skip it and come back to it at the end.
- When you finish – stay seated and turn your exam face down on your desk.
- You will then receive a BELIEVE Survey.
    - There are no right and wrong answers to this.
- Questions?

Practical & Believe Survey (35 min):

- (Pass out exams face down.)
- (Set the digital timer for 20 minutes.)
- Tell students to begin.
- (Project the image of the shark on the SMART board.)
- (As students finish Assistant Team Lead should quietly collect tests.)
- (Team Lead should immediately grade tests.)

Break (5 min):

- Let students stand up/stretch/get water/use the bathroom, etc.
- (Team Lead finishes grading exams.)

Debrief (10 min):

Goal: For students to connect all the work they did/did not do to their test grade. Powerful opportunity to connect hard work with a strong outcome or vice versa.

- Ask students how they were feeling before the test.
- Ask students how they felt during the test.
- (Return graded exams.)
- Ask students how they feel about their grade.
- Ask students what they think helped to get the grade they received.
- Ask students which of the things they did to prepare for this exam they could use in the coming 9th grade year.
- Review the concept that preparing for tests has positive outcomes.
    - Creating concept maps to KNOW information teachers give you.
    - Clarifying information by asking teachers questions to KNOW information.
    - Creating flash cards and time to study so you can OWN information.
    - Study with other people to OWN information.
- End on a high-note.
    - Congratulate students on their hard work, helping each other out and new learning.
    - Bring group in for a "Go Awesome!"

Thank You (15 min):

- (Gather all cohorts together.)
- (Team Lead pull aside students who are doing thank-you's and check in with them quickly and give them the mentor gift.)
- (Assistant Lead have all other students sit in the amphitheater.)
- (Have all mentors line-up facing sitting students.)
- (PIM or Team Lead choose a student to do the first thank you. Have them walk up and stand next to the mentor they are thanking but face the group to give their thank you & gift so that everyone can hear.)
- (Repeat the above until all mentors have been thanked.)
- (IPM – take a group picture.)
- (Have all students stand up and create a high-five tunnel for the mentors to walk through.)
- (When all mentors have cleared the tunnel have students grab their backpacks and walk back to the bus.)

Prep for Family Celebration (60 min)
Goal: Students prepare to share their Bridge Program experiences with their families.

Family Celebration Intro (5 min):

- Share your experiences the last two weeks with your family.
- We will do this in two ways:
  - Family Activities
    - Science Lab: Each group will choose one activity that we did this week and allow our families to try them out.
    - Conservation Tree: We will share what we have learned about the conservation of invertebrates, marine mammals and fish with our families and ask them what they can commit to help protect these animals.
  - Presentations
    - I AM Poem (All)
    - PEN Reflection (Share who will be doing this).
- We will have time to prepare for all of these this afternoon.

Practice I AM Poems (20 min):

- All students will come up together to present your I AM Poem in front of the audience.
- We will present line by line.
  - Example:
    - I am Shara. I am Matt. I am Isabel.
    - I am Latina. I am shy but courageous. I am a strong woman.
- (Have students stand together in a line like they will for the Family Celebration and practice.)

Family Activity Practice: (35 min) * *Happening at the same time as the Conservation Tree*
During this time the IPM will come and take the two students who are sharing the conservation message with families.

- Share which activity students will be doing with the families.
- Decide how to share these activities with your families.
  - ***Activity should take ~5 min from beginning to end.***
  - What background information do they need?

  - Who will run the activity?
  - Who will debrief the activity?
- Decide which students will do each of these parts.
- (Gather supplies and practice.)
- (Last 5 minutes set up supplies in the area where activity will take place during family celebration.)

<u>Conservation Tree:</u> (35 min) ** Happening at the same time as Family Activity Practice*

- Explain the purpose of the conservation tree: (5 min)
  - All week you have been learning humans can help protect invertebrates, fish and marine mammals.
  - Science leaders share their knowledge with others so that everyone can help to conserve these animals.
  - Each of you will be in charge of one station at the Conservation Tree – Invertebrates, Fish or Marine Mammals.
  - When people approach you – you will explain what your organisms is, one threat your animal is facing from humans and invite people to read the tweet in the tree about conserving these organisms.
  - You will then offer each person the opportunity to commit to helping your animal by writing their name on a paper hand and hanging it on the tree trunk.
- Create Conservation Tree: (5 min)
  - Each team (Invertebrates, Fish and Marine Mammals) need to hang up picture examples of their animals and the conservation tweets students created.
- Practice Conservation Message (15 min)
  - Students should:
    - Explain what their organism is while pointing to pictures.
    - Explain some of the ways their animal is being harmed by things humans do.
    - Share one way people can help protect these animals (this should be a relatively simple thing that most people can commit to – example: turn off the lights, use cloth grocery bags, shop for shampoo without sulfates, etc.)
    - Ask people if they want to commit to helping protect these animals- if the answer is yes ask them to write their name on a hand and hang it on the conservation tree trunk.
- Cut paper hands (10 minutes)
- (Return students to their groups.)

I Am… Poem

I am	Your name
I am	Name an identifying characteristic about yourself… (*could be your nationality, ethnicity, gender, physical attribute, etc.)*
I care about	List something you care about…
I want you to know	Something you want people to know about you…
I believe	Identify something you believe to be true… (*could be a tradition, a religion, something cultural, something about people or the world, etc.)*
I dream	Name something you wish…
I make a difference	Name a way you are making a difference…
I am	Your name
We are	Name something you believe to be true about your group.

Name: _____

Ocean Leader Bridge Program Practical Exam

1. Define Invertebrate:

2. Name two characteristics of marine mammals:

3. Define Adaptation:

4. Look at this picture of a rocky seashore invertebrate. Name one adaptation this organism has and describe how that adaptation helps it to survive at the rocky seashore.

5. Look at the picture of the fish on the board. Name one adaptation this animal has **and** describe how that adaptation helps this fish to survive.

6. Provide an example of each of the below:
    a. Invertebrate
    b. Fish
    c. Marine Mammal

7. Look at these two pictures. Circle the one that is a sea lion <u>and explain</u> how you know it is a sea lion.

8. Describe one way you could help protect invertebrates.

Multiple Choice
<u>Directions</u>: Choose the best answer(s).

9. Which of the below <u>incorrectly</u> matches the animal to its adaptation?
    a. Giant Keyhole Limpet: Large sticking area
    b. Garibaldi: Operculum
    c. Thresher shark: Swim bladder
    d. Grey whale: Baleen

10. Which of the below are characteristics of a cartilaginous fish? (Circle as many as are correct.)
    a. Oily liver
    b. Skeleton made of bones
    c. Operculum (bony cover over gills)
    d. Swim bladder
    e. Skeleton made of cartilage

Family Celebration

Set Up

- In Plaza Del Sol:
  - Set up two tables by Conservation Tree.
  - Have cut-out hands, crayons, markers, pencils and tape set out in art bins on the table.
  - Set up a screen and play Marine Mammal Mural time-lapse video on loop.
  - Set up a screen and projector.
    - Place slideshow of week on repeat.
  - Set up microphone + microphone stand for reflection pieces
  - Set up all technology to broadcast Family Celebration on Zoom.
  - Set up chairs in groups of 2-4 chairs 3 feet apart
    - (Seats will be assigned up on entry.)
    - Label each set of seat: Group 1, Group 2, Group 3, etc.
    - Have a corresponding "ticket" card for each labeled "Group 1, Group 2, Group 3, etc.)
- Set up Check-In desk with two chairs outside of front doors.
  - Have bottles of hand sanitizer on table.
- Have additional chairs off to the side to be added to any family pods that have more people than seats.

Agenda

Check In			
Time	Task	Location	Person
5:30 pm	Check In: - As families approach ask them how many people are in their group and assign them an appropriate pod of seats (example Groups 1-10 are two people, Groups 11-15 are three people, and Groups 16-30 are four people.) - Give each family member a ticket with their Pod number on it. - Direct families to Plaza Del Sol. Escorts in Plaza Del Sol: - Have four students at the entryway of the Plaza Del Sol to help show families where their pod of chairs are. - If families have more people than seats in their pod students should bring over additional seats and set them up being careful to maintain social distancing. - Let families know they can leave anything on the seats and then wander around the Plaza Del Sol until the program starts.	In front of entryway	
Interactive Program			
5:30 pm	Families can wander around the Plaza Del Sol and participate in: - Student activities - Conservation Tree - Watching time lapse video of Marine Mammal Mural - Watching slide show of program	Plaza Del Sol	
5:55 pm	IPM makes an announcement for everyone to be seated for program	Stage	
Reflection Program			
6:00 pm	IPM to welcome families and thank them for coming and supporting their student. IPM to give a short overview of Ocean Leader program. IPM to give a short overview of the Bridge program with a focus on reflection.		
	Reflec		

Instructor Supplement

Instructor Supplement

Information about Sand Crabs (For Science Lab: Day 3):
http://www.sdnews.com/view/full_story/10511157/article-Tidelines--Sand-crabs-really-dig-La-Jolla-Shores-beach

Shark Anatomy: https://89681458-8600-48ca-99c5-510cb9d2a8e0.filesusr.com/ugd/5ed219_a67c680b1a6840269ac291f8d5165cde.pdf

Background Information for the Teacher - FISH

- Fish species have evolved different adaptations to best suit the requirements of their environments and lifestyles.

Different body shapes:

- **fusiform:** streamlined and cylindrical, fish with this body type are fast and can swim continuously for long distances.
- **depressed:** flattened body from back to belly like a pancake, enables these fish to ambush prey items with short bursts of speed as well as bury in the sand to hide from other predators.
- **compressed:** flattened side to side, allows for sharp, quick turns, very maneuverable.
- **ribbon:** snake-like, slow swimmers, but easily move through crevices, hide under rocks or in cracks and ambush prey that come to close to their hideout.

Different caudal fin (tail) shapes:

- **lunate:** fastest swimmers, max speed with a minimum effort over long distances.
- **forked:** moderately fast, continuous swimmers.
- **squared:** very maneuverable, capable of short bursts of speed for short distances.
- **rounded:** very maneuverable, capable of short bursts of speed for short distances.
- **tapered:** slow swimmers use body instead of tail for propulsion.

Different mouth positions:

- **terminal:** body ends at the mouth (most fish have variations on this position).
- **superior:** mouth points upward from the underside, feeds on prey from below.
- **inferior:** mouth parts downward from the underside, feeds on prey from above.

- **Different dorsal fin shapes:**
- **single:** more primitive form
- **double:** more advanced form

- External structures in sharks-
- **Integument (skin/protective covering)**- hold sharks together, site for muscle attachment, protection against abrasion/infection, aids in hydrodynamic efficiency (aids in swimming), it does not allow water and ions to flow through, but does

allow gases such as oxygen to flow through.

- **Color** is usually grays, browns, and blues, **countershading** is important since it can be used to camouflage to "hide" from their prey. Since the top of their body is darker it looks like the bottom or the water from above and from below their light bellies makes it hard to differentiate between them and the surface of the sun.
- **Dermal denticles**, very similar to teeth they (evolved from teeth) placoid scales do not increase in size as the shark grows, rather new scales are added in between older scales. It feels like sandpaper.
- **Fins-**used for stability, propulsion, communication, reproduction
- caudal (tail): used for propulsion-it moves side to side.
- dorsal: used to keep shark from tipping side to side (may have 1 or 2).
- pectoral: paired fins used for turning, changing direction.
- pelvic: paired fins used for stability (like a rudder).
- anal: used to keep shark from tipping from side to side.
- **Claspers**-male sharks only, used for internal fertilization. These transfer sperm into the reproductive tract of the female.
- **Jaws**: entry point for food and water, open and shut, clumsy, usually subterminal (interior) mouths, replaceable teeth used for gripping and tearing prey, some sharks and rays are filter feeders which take water or sediment into their mouths and pass it over their gills where the food gets trapped, these species have terminal mouths.
- **Eyes** are used to detect movement, color changes, predators, prey, companions, design of eye is different than those in terrestrial organisms due to air/water interface, sharks are often nocturnal predators and have developed guanine platelets behind their retinas to aid in reflecting light for increased night vision, this is why shark eyes often seem to "shine".
- **Nostrils**: olfactory sense strong in sharks, smell more accurate than taste, detects negative stimuli, they are closed of at the end because they are only used for smelling, not breathing.
- **Taste**: sensors may be located inside and outside of mouth (barbels, fin tips, body), used to detect food, noxious substances.
- **Ampullae of Lorenzi**: cells used in electroreception located on the head, snout, and mouth, similar to the hair cells found in the lateral line these nerve cells fire in pit organs: scattered throughout the body these cells are used for detecting water displacement similar to the function of the lateral line in fishes.
- **Lateral line**: row of microscopic organs sensitive to changes in the surrounding water pressure, enabling the shark to detect minor vibrations.

Internal Structures in Sharks

- **Heart**: pumps blood throughout circulatory system (heart to gills to become oxygenated to body to heart), heart size in sharks is small compared to other vertebrates.
- **Muscles**: red (aerobic (with oxygen)/sustained (for normal activity)), white (anaerobic (without oxygen) /burst (when there is high activity and less oxygen present)), usually distinctly separate.
- **Gills**: respiratory organs, most sharks have five gill slits.
- **Kidneys**: ion concentration in sharks is slightly greater than that of seawater,

and therefore they do not need to excrete large amounts of salts like marine fish, they achieve this concentration by increasing the amount of organic compounds (urea and TMAO) in their tissues, kidneys are still important for removing waste.

- **Liver**: sharks have exceptionally large livers that hold large amounts of light oil, these oil stores act much as the swim bladder in fish does and helps sharks to maintain neutral buoyancy in water. This oil is lighter (less dense) than water.
- **Digestive system**: stomach, intestines, used for digestion, food absorption.
- **Nervous system**: sharks have small brains compared to other vertebrates, but similar design.
- **Gonads**: ovaries (female)/testes (male), used for reproduction, claspers used for internal reproduction.
- There are three types of reproduction: oviparous, ovoviviparious, viviparous.
- oviparous: lay eggs that hatch outside the mother's body.
- ovoviviparous: retain the fertilized eggs in the oviduct where they develop and are born after they hatch .
- viviparous: the young develop within the uterus.

- **External Structures in Fish (bony)**
- **Integument (skin)**: holds fish together, site for muscle attachment, protection against abrasion/infection, allows gases such as oxygen to pass through.
- **Scales**: modern fish have cycloid/ctenoid scales, lightweight, overlapping for increased flexibility, evolved from plate-like armor in ancient fish, scales can **regenerate** (grow back), provide protection from abrasion/infection/predators.
- **Fins**: used for stability, propulsion, communication, reproduction.
- caudal (tail): used for propulsion, many different types of caudal morphologies.
- dorsal: used to keep fish from tipping from side to side (have 1 or 2).
- pectoral: paired fins used for turning, changing direction.
- anal: used to keep fish tipping from side to side, sometimes have reproductive uses.
- **Color:** important in social roles, communication, mimicry, disguise, camouflage, physiological importance.
- **Jaws**: entry point for food and water, different morphologies evolved for different life histories, different teeth also for different feeding strategies (canine/rockfish, villiform/mackerel, molariform/bat ray), filter feeders consume very small prey whereas hinged jaws like sharks consume very big prey.
- **Eyes:** used to detect movement, color changes, predators, prey, companions, design of eye is different than those found in terrestrial organisms due to the air/water interface, focusing is done by changing the distance between the lens and the retina.
- **Nostrils**: smell more accurate than taste, detects negative stimuli.
- **Taste:** sensors may be located inside and outside of mouth (barbels, fin tips, body), used to detect food, noxious substances.
- **Lateral Line:** used to detect vibrations in the water that may originate from predators, prey, schoolmates, or inanimate objects, this is how fish school, find prey, etc.

Internal structures in fish

- **Heart:** pumps blood throughout the circulatory system (heart to gills to body to heart), heart size in fish is small compared to other vertebrates.
- **Muscles:** red (aerobic/sustained), white (anaerobic/burst), usually distinctly separate.
- **Gills:** respiratory organs, counter current system allows for maximum oxygen loading, gills also function in osmoregulation (chloride cells) remove salt.
- **Kidneys:** osmoregulatory centers, in marine environment fish are hyposmotic therefore they must drink seawater to prevent dehydration however salts must be excreted through urine, small salts are excreted by chloride cells.
- **Swim Bladder:** present in most fish, provides buoyancy without monopolizing internal space, it is filled with gas and is attached to the gills to get the gas .
- **Digestive system:** stomach, intestines, used for digestion, food absorption.
- **Nervous system:** fish have small brains compared to other vertebrates, but similar design.
- **Gonads:** ovaries (makes the eggs)/testes (make the sperm), used for reproduction most species have external fertilization (spawners), which the female sheds a large number of eggs, the most common is oviparous.

- **Examples:**
- Leopard Sharks: These sharks are a brownish color with dark spots over their body. Young leopard sharks feed mainly on small crabs that move along the surface of the sediment and as they grow larger they feast on larger crabs, worms, fishes, and even other sharks. Enjoy hiding out in the kelp forest.
- Shovelnose guitarfish: It is named this because of its pointed snout and guitar-shaped body. Although it resembles a shark, it is actually a ray. This species is very primitive and can be traced back 100 million years. They spend most of their time cruising on the bottom and burrowing in the sand. They have small blunt teeth and eat hard-shelled invertebrates such as clams and crabs.
- Stingray: These are closely related to the sharks and like sharks have a body made out of cartilage. Rays have rounded bodies. These are small and swimming along the bottom and burrow in the sand. A stingray's spine isn't at the tip of the tail as most think but it lies on top a third of the way down the tail. A way to avoid a sting is to do the "stingray shuffle".
- Smoothhound: These sharks move into shallow water from November to December. These sharks use their flat, pavementlike molars for grinding up hard-shelled crabs.
- Horn Sharks: These are timid animals and spend most of the day holed up in dark crevices or caves and coming out at night to feed on clams and shellfish. These are true bottom-dwellers and swim very poorly and sometimes crawl along the rocks on their pectoral fins. High bony arches above their eyes give them their nicknames "bullhead shark." The name horn shark comes from the sharp hornlike spine located in front of the dorsal fin.
- Angel Shark: These creatures spend their lives on the ocean floor. They nestle in sandy channels along fringes of the forest. These are often confused with rays. They have fins that are shaped like angel shape wings.