**Workshop Outline and Leader Notes**

There are five key science ideas addressed in the module; they are highlighted in this suggested workshop plan.

1. What are some of the specific types of evidence that scientists gather as they examine marine sediment cores?
2. What Earth processes combine to produce sequences of sediments on the ocean floor?
3. How does the advance and retreat of glaciers affect rates of deposition and other Earth processes?
4. What are climate cycles and what causes them?
5. What is proxy data and how is it used to reveal past climate history?

Because of time limitations, not all of these key ideas are addressed thoroughly in this workshop.

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| Section | Detailed Notes |
| **Workshop Introduction**  [15 minutes] | **CLIMATE Detectives**  (While Slide #1 is showing)  • Welcome and thank attendees  • Introduce workshop leaders  • Give a brief overview of the schedule  • Point out other logistics (bathrooms; location of water or refreshments; etc.)  • Distribute an agenda and ask if there are questions about the schedule before you start.  • Explain that you will start with some slides to orient them to the EarthLabs project and to an EarthLabs general climate science resource before starting work on the Cryosphere module itself.  • Show PowerPoint slides 2-14 of *Climate Detectives.pptx*  Suggested comments are included in the Notes section at the bottom of each slide. Be sure to highlight the workshop goals.  • At slide #11 (shows names of the six Climate Detectives sections or Labs ) ask if there are any questions about what participants have seen in the introduction.  • At Slide #12, with the EarthLabs url’s, and ask teachers to go first to the **Educator** web site and open the **Climate Series Intro**. Show Slide 13, which highlights the Climate Series Introduction. |
| **Climate Series Introduction**  [30 minutes] | **CLIMATE SERIES INTRODUCTION**  • **Switch from projecting the PowerPoint to projecting the EarthLabs module.** Project the EarthLabs Home Page for the Educator’s web site and open the Climate Series Intro web page.  • Point out the 4 main sections of the Climate Series intro (Brief descriptions of the 4 climate modules; In the Classroom; Science Notes; and Keeping Up to Date  • Mention briefly that the Introduction page just holds descriptions of the 4 climate modules. Then go to the section titled In the Classroom. Have participants do the same on their own computers.  **In the Classroom**  • Point out the link for “Student Prerequisite Knowledge: The Earth System”, and ask participants to share their prior understanding of “the Earth system”. What does that phrase mean to them?  • Distribute: printed copies of Earth System: The Basics, and give participants time to read the document (5 – 6 minutes).  • Discuss the Earth System reading: What did participants learn? Reactions, comments, questions. Having a general overview of the Earth system is important to understanding all of the EarthLabs modules, and in particular the Climate Series.  • Open the Crosscutting Themes link and briefly summarize the four major crosscutting themes. (The Earth System has already been covered.)  • Highlight one additional item on the list: Student Access to Computers. The module can certainly be adapted to be taught in a one-computer classroom, although it is preferable that all students have their own computers.    • Emphasize that teachers should read the rest of the In the Classroom material on their own as they prepare to teach the module.  **Science Notes**  • Explain that reading and discussing the science notes could be a workshop in itself, and so there is not time to go through all of them now, but prior to starting a climate module, teachers should take the time to read through them to add to their own background knowledge about the complex topic of climate and associated representations.  • Highlight one element of the Science Notes: Under Greenhouse Gases and Climate, scroll down to the Scott Denning video and show it to the class. (6 minutes)  • Give participants two minutes to discuss the video with a partner. Next,  ask for responses to the video. Comments? Questions? Be prepared to address questions.  **Keeping Up to Date**  • Just show teachers that this resource exists, and mention that the web sites listed are kept up to date with current information about climate science and climate change. |
| **Title Page**  [2 minutes] | • Open Climate Detectives title page on the EarthLabs **Educator** web site and point out the main sections. Mention that the sections are the same for every Climate module in the series. |
| **Lab Overviews**  [5 minutes] | • Briefly show the Lab Overview page on the **Educator** site, then skip down to Lab 1 in the navigation menu to highlight the Headings there. It is the same structure for every Lab. Highlight the importance of the resources on the Educator Web site, even though for most of the rest of the workshop participants will be using the Student site, which holds the actual curriculum.  • Click the link in the upper right corner to open Lab 1 of the **Student** Climate Detectives module.. Have participants follow on their own computers.  • Point out the links that connect the Student and Teacher web sites, and mention that assessments and answer keys are available to educators by application. Restricted files when clicked will prompt the user to submit an application. |
| **Challenge**  [5 minutes] | In the navigation menu go back to the Climate Detective Challenge page, and then distribute print copies of the challenge and give participants time to read it. There may not be time in the workshop for participants to address all parts of the challenge but in the classroom students should have the time to do that. |
| **Lab 1 Intro**  [5 minutes] | Summarize for participants the three important points while showing the Web page on the classroom screen.   1. Erosion over millions of years ends up in the ocean and gives clues as to what was happening on land: rapid rate of sediment build-up means glaciers are melting and washing soil into the ocean. Slow rate means the opposite. 2. Microfossils are introduced. A specific species can indicate warmer or colder water temperature, and also a time frame for when that species was alive. 3. Sediment core is introduced briefly; it’s good for students to know what a sediment core is before watching the video in the next section. (5 minutes) |
| **Lab 1A**  [10 minutes] | Show the video, Tour of the Joides Resolution . Remind participants that most of the elements of the tour are covered in more detail in the module. The take-away message at this point is that the JOIDES Resolution is a floating science lab as well as a drill ship. |
| **Lab 1B**  [10 minutes] | There are 15 videos of crew members describing their responsibilities on the JR. Show 3 of them (Suggest Chris Moy, Christina Belanger, and Lindsay Worthington.) The describe the Crad Game that students play, but do not use the game in the workshop,for time purposes. |
| **Lab 1C**  [10 minutes] | Mention that Lab 1C describes the destination of the expedition (Gulf of Alaska) and why it was selected. Show the first 3 minutes of the Ken Ridgeway video, and ask for questions or clarifications. This sets the context and the rational for the whole expedition. |
| **Lab 2A**  [60 minutes] | Remind participants of the video tour of the JR and specifically about the derrick and the machinery that recovers sediment cores from the ocean floor. Have form teams of 4 to invent and build a boring machine that can recover cores from the PlayDoh “sediment”. |
| **Break**  [10 minutes] |  |
| **Lab 3**  [3 minutes] | Describe the content of Lab 3, but do not use any of it in the workshop. Remind participants about the Milankovitch cycles they have seen in the Climate Series Introduction. Lab 3 provides some of that information to students. |
| **Lab 4 Intro**  [10 minutes] | Have participants read the Lab 4 Intro page. Address any questions. |
| **Lab 4A**  [5 minutes] | Describe the activity but do not actually do it. If you have prepared a “sediment” jar previously you can show it now. |
| **Lab 4B**  [25 minutes] | Have participants read 4B and then provide them with ice cubes containing sediments and the rest of the materials so they can work through this activity. |
| **Lab 5 Intro**  [10 minutes] | Show the video in the Intro: It introduces the ways in which microfossils and Earth’s magnetic field can help indicate the age of sediment layers in a core. Much more detailed information is provided in Lab 6. Provide time for participants to ask questions. |
| **Lab 5A**  [25 minutes] | Have participants use the Earth History Timeline cards to create a timeline. |
| **Lunch**  [40 minutes] |  |
| **Lab 5B**  [30 minutes] | Have participants use the Miocene Timeline Cards to create a timeline. |
| **Lab 6 & Break**  [130 minutes] | Lab 6 is the culmination of this investigation. Have participants form teams of 4 to read through the Lab, addressing questions they arise, and do their analysis of the core. Allow 120 minutes for this work, plus an additional 10 minutes for a break whenever that seems like a good time. |
| **Share Findings**  [30 minutes] | This is an opportunity not only for groups to share findings but also to clarify questions and address the differences in analysis among the groups. |
| **Wrap-Up**  [10 minutes] | • Thank participants for attending. Possibly invite them to contact you with questions they might have as they prepare to implement or are implementing the module.  • Possibly pass around a sheet to collect names of teachers who want to share their e-mails addresses with one another, so they can communicate as they implement the module. |