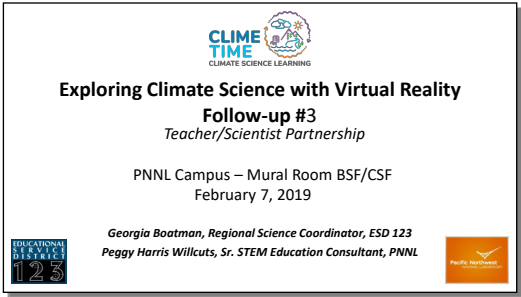


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| <p align="center"><b>Facilitation Guide</b></p> <p align="center"><b>Educational Service District 123 and Pacific Northwest National Laboratory</b></p> <p align="center"><b>Exploring Climate Science with Virtual Reality Follow-up 3</b></p> <p align="center">Ambitious Science Teaching</p> <p align="center">Eliciting Student Ideas and Adapting Instruction</p> <p align="center">Planning for Formative Classroom Tasks</p> |                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                |
| Slide 1                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                | <p><b>Slide 1 10 minutes</b></p> <p><b>Welcome and Introductions</b></p>                                                                                                                       |
| Slide 2                                                                                                                                                                                                                                                                                                                                                                                                                              | <p align="center"><b>Ambitious Science Teaching</b></p> <p align="center">4 CORE SETS OF TEACHING PRACTICES</p> <ul style="list-style-type: none"> <li>• 30 years of research - NSF</li> <li>• Anchoring teaching in complex natural events</li> <li>• Using a variety of discourse strategies - student involvement</li> </ul> | <p><b>Slides 2-3 5 minutes</b></p> <p><b>Quick Introduction to / Reminder of Ambitious Science Teaching</b></p>                                                                                |
| Slide 3                                                                                                                                                                                                                                                                                                                                                                                                                              | <p align="center"><b>8 Fundamental Themes of Ambitious Science Teaching Video Recording Tool</b></p>  <p>Get to know the Video Recording Tool!<br/>Highlight key words...</p>                                                                | <p><b>Slides 2-3 5 minutes</b></p> <p>Hand out Recording Tool.<br/>Look in each column at the 8 Fundamental Themes of AST. Take a moment to highlight the key words in each columns title.</p> |
| Slide 4                                                                                                                                                                                                                                                                                                                                                                                                                              | <p align="center"><b>8 Fundamental Themes of Ambitious Science Teaching</b></p>  <p>Let's take a look into a classroom to see what this looks like. Take notes using the scaffold provided!</p>                                              | <p><b>Slide 4-10 45 minutes</b></p> <p><a href="https://vimeo.com/106398654">https://vimeo.com/106398654</a></p>                                                                               |



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Georgia Boatman  
Regional Science Coordinator  
Educational Service District 123

Peggy Willcuts  
Senior STEM Consultant  
Pacific Northwest National Laboratory

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| Slide 5 | <p>8 Fundamental Themes of Ambitious Science Teaching (1-2)</p> <p>Theme 1: Learning is oriented around complex and puzzling phenomena.</p> <p>Theme 2: Students' ideas and experiences are treated as resources for everyone's learning.</p> | <p><b>Slide 4-10 45 minutes</b></p> <p>The ambitious teacher is someone who “works with students’ ideas” over time. What would you experience in classrooms where ambitious teaching was the focus? You would see and hear each of the 8 fundamental themes of AST. Go through each slide 5-8 to see the themes. Give people time to finish recording their ideas. Ask for places in the video where they spotted various themes.</p> |
| Slide 6 | <p>8 Fundamental Themes of Ambitious Science Teaching (3-4)</p> <p>Theme 3: Teachers provide varied opportunities to reason through talk..</p> <p>Theme 4: Thinking is made visible.</p>                                                      | <p><b>Slide 4-10 45 minutes</b></p> <p>The ambitious teacher is someone who “works with students’ ideas” over time. What would you experience in classrooms where ambitious teaching was the focus? You would see and hear each of the 8 fundamental themes of AST. Go through each slide 5-8 to see the themes. Give people time to finish recording their ideas. Ask for places in the video where they spotted various themes.</p> |
| Slide 7 | <p>8 Fundamental Themes of Ambitious Science Teaching (5-6)</p> <p>Theme 5: Students construct and revise models and explanations..</p> <p>Theme 6: Specialized tools support talk and writing..</p>                                          | <p><b>Slide 4-10 45 minutes</b></p> <p>The ambitious teacher is someone who “works with students’ ideas” over time. What would you experience in classrooms where ambitious teaching was the focus? You would see and hear each of the 8 fundamental themes of AST. Go through each slide 5-8 to see the themes. Give people time to finish recording their ideas. Ask for places in the video where they spotted various themes.</p> |



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Georgia Boatman  
Regional Science Coordinator  
Educational Service District 123

Peggy Willcuts  
Senior STEM Consultant  
Pacific Northwest National Laboratory

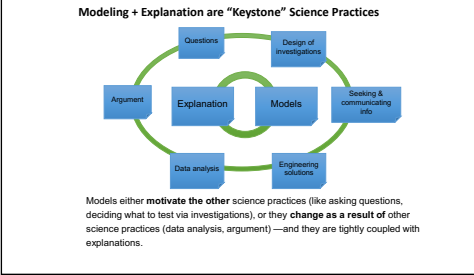
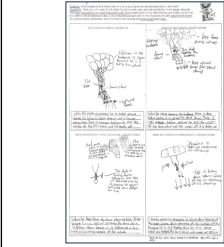
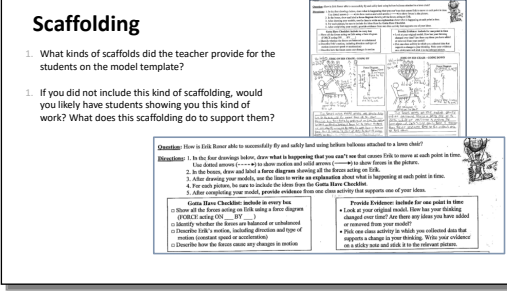
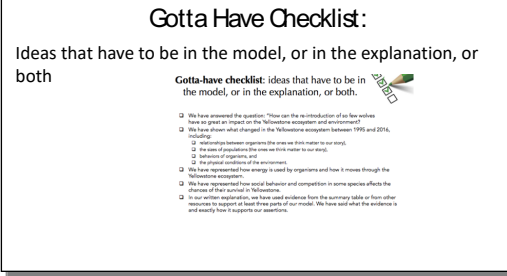
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| Slide 8  | <p>8 Fundamental Themes of Ambitious Science Teaching (7-8)</p> <p>Theme 7: Activities build toward cumulative understandings..</p> <p>Theme 8: Everyone is helped to participate..</p>                                                                                                                                                                                                                                                                                                                                                                                                                   | <p><b>Slide 4-10 45 minutes</b></p> <p>The ambitious teacher is someone who “works with students’ ideas” over time. What would you experience in classrooms where ambitious teaching was the focus? You would see and hear each of the 8 fundamental themes of AST. Go through each slide 5-8 to see the themes. Give people time to finish recording their ideas. Ask for places in the video where they spotted various themes.</p> |
| Slide 9  | <p>AST Scavenger Hunt Get Ready</p> <p>Count off by 4:</p> <ol style="list-style-type: none"> <li>1. Planning for engagement with important science ideas</li> <li>2. Eliciting student ideas</li> <li>3. Supporting ongoing changes in thinking</li> <li>4. Pressing for evidence-based explanations</li> </ol>                                                                                                                                                                                                                                                                                          | <p><b>Slide 4-10 45 minutes</b></p> <p>Read from slide</p>                                                                                                                                                                                                                                                                                                                                                                            |
| Slide 10 | <p>AST Scavenger Hunt Go!</p> <p>Be prepared to share out your findings.</p> <p>What are the three best tips/resources you found?</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <p><b>Slide 4-10 45 minutes</b></p> <p>Four minute reporting out for each group.</p>                                                                                                                                                                                                                                                                                                                                                  |
| Slide 11 | <p>Lifted</p> <p>Watch the video of Erik Roner.</p> <p>Question: How is Erik Roner able to successfully fly and safely land using helium balloons attached to a lawn chair?</p> <p>Directions:</p> <ul style="list-style-type: none"> <li>• Draw your initial model of what is happening <b>that you can’t see</b> that causes Erik to move at each point in time. Use dotted arrows to show motion and solid arrows to show forces in the picture.</li> <li>• Draw and label all of the forces acting on Erik.</li> <li>• Write an explanation about what is happening at each point in time.</li> </ul> | <p><b>Slides 11-21 15 minutes</b></p> <p>Last time we watch the Erik Roner video to see an engaging phenomena</p>                                                                                                                                                                                                                                                                                                                     |



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Georgia Boatman  
Regional Science Coordinator  
Educational Service District 123

Peggy Willcuts  
Senior STEM Consultant  
Pacific Northwest National Laboratory

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| <p>Slide<br/>12</p> | <p>Modeling + Explanation are “Keystone” Science Practices</p>  <p>Models either motivate the other science practices (like asking questions, deciding what to test via investigations), or they change as a result of other science practices (data analysis, argument)—and they are tightly coupled with explanations.</p>                  | <p><b>Slides 11-21 15 minutes</b></p> <p>We learned about models and explanations as key to all of the practices</p>              |
| <p>Slide<br/>13</p> |  <p>Before and after template for 9<sup>th</sup> grade unit on forces</p>                                                                                                                                                                                                                                                                     | <p><b>Slides 11-21 15 minutes</b></p> <p>We examined some student samples of initial and final models</p>                         |
| <p>Slide<br/>14</p> | <p><b>Scaffolding</b></p> <ol style="list-style-type: none"> <li>What kinds of scaffolds did the teacher provide for the students on the model template?</li> <li>If you did not include this kind of scaffolding, would you likely have students showing you this kind of work? What does this scaffolding do to support them?</li> </ol>  | <p><b>Slides 11-21 15 minutes</b></p> <p>We learned how to scaffold for models to help students capture ALL of their thinking</p> |
| <p>Slide<br/>15</p> | <p><b>Gotta Have Checklist:</b></p> <p>Ideas that have to be in the model, or in the explanation, or both</p> <p><b>Gotta-have checklist:</b> ideas that have to be in the model, or in the explanation, or both.</p>                                                                                                                       | <p><b>Slides 11-21 15 minutes</b></p> <p>One of those scaffolds was the Gotta Have It Checklist</p>                               |



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Georgia Boatman  
Regional Science Coordinator  
Educational Service District 123

Peggy Willcuts  
Senior STEM Consultant  
Pacific Northwest National Laboratory



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| <p>Slide 21</p> | <p><b>Argue from Evidence Gallery Walk</b></p> <ul style="list-style-type: none"> <li>• Visit each team as a group.</li> <li>• Listen to their argument.</li> <li>• Give feedback and be ready to take back ideas to discuss with your group.</li> </ul> | <p><b>Slides 11-21 15 minutes</b></p> <p>We saw the value of making your argument to each other</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <p>Slide 22</p> | <p>Representing Student Ideas Publicly Teachers' Choice</p> <p>Time to decide.....</p>  <p><small>Pixelbay License Free for commercial use</small></p>                  | <p><b>Slide 31 45-60 minutes or as time allows</b></p> <p>Talk with your partner(s). Make a decision about how you will engage in the practice of representing student ideas publicly. Remember your choices are CER, Models and Explanations. This is the time to begin to develop an actual plan for how they will Represent Student Ideas Publicly as part of eliciting student ideas.</p> <ul style="list-style-type: none"> <li>o Given you a couple of ways think about this work</li> <li>o Given you a way to think about phenomena the students can do this work around</li> <li>o Talked about public representations over time to build on and refine</li> <li>o We want you to think about the phenomena you think you might use and about and the work you do in your classroom, how do you embed a formative classroom task. This is your new work. Embedding not adding on.</li> <li>o a very brief reminder of the 4 elements of AST and where we are in the process</li> <li>o Time to translate their phenomena thinking into planning using the AST Planning for Engagement Tool section 4</li> </ul> |



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Georgia Boatman  
Regional Science Coordinator  
Educational Service District 123

Peggy Willcuts  
Senior STEM Consultant  
Pacific Northwest National Laboratory

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| <p>Slide 23</p> | <p>Climate Science &amp; VR</p>  <p><small>Picture by P. Willcuts</small></p>                                                                                                     | <p><b>Slide 32 60 minutes to 90 minutes Climate Science App</b> Audio and Video casting,</p> <ul style="list-style-type: none"> <li>• Screenshot and video capture</li> <li>• Downloading to a computer screen</li> </ul> <p>• Teacher Feedback:</p> <ul style="list-style-type: none"> <li>• <a href="https://drive.google.com/open?id=1Hp-v9OM2BJPlaUsFb1x8SnkR5WXtnVnD7TjM-tMSqlU">https://drive.google.com/open?id=1Hp-v9OM2BJPlaUsFb1x8SnkR5WXtnVnD7TjM-tMSqlU</a></li> </ul> <p>• Student Feedback:</p> <ul style="list-style-type: none"> <li>• <a href="https://drive.google.com/open?id=1FsuyMw_LpjCWyvXj9dLbkTn_CoDgRaiZSB5OMofgwE">https://drive.google.com/open?id=1FsuyMw_LpjCWyvXj9dLbkTn_CoDgRaiZSB5OMofgwE</a></li> </ul>                                                                                                                                         |
| <p>Slide 24</p> | <p>Nose to the Grindstone!</p>  <p><small><a href="https://commons.wikimedia.org/wiki/File:Grindstone.jpg">https://commons.wikimedia.org/wiki/File:Grindstone.jpg</a></small></p> | <p><b>Slide 33 Whatever time is left</b><br/>A brief reminder of where we are in the process</p> <ul style="list-style-type: none"> <li>o Given you a couple of ways think about this work</li> <li>o Given you a way to think about phenomena the students can do this work around</li> <li>o Talked about public representations over time to build on and refine</li> <li>o We want you to think about the phen. you think you might use and about and the work you do in your classroom, how do you embed a formative classroom task. This is your new work. Embedding not adding on.</li> <li>o a very brief reminder of the 4 elements of AST and where we are in the process</li> <li>o Time to translate their phenomena thinking into planning using the AST Planning for Engagement Tool section 4</li> </ul> <p>Then using the Planning for Engagement tool Step 4</p> |



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Georgia Boatman  
Regional Science Coordinator  
Educational Service District 123

Peggy Willcuts  
Senior STEM Consultant  
Pacific Northwest National Laboratory

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|          |                                                                                                                                                                                                                                                                                                                                                                                                                           | Be prepared to have something in writing that gets uploaded to the folder on Google Drive. Make the case for why a large variety of documents can be helpful to other teachers. We want products to share. A platform will be created by which these products will be shared. |
| Slide 25 | <p>Creative Commons Licensing</p>  <p>License: <a href="https://creativecommons.org/licenses/by/4.0/">Creative Commons Attribution 4.0</a><br/> Georgia Boatman<br/> Regional Science Coordinator<br/> Educational Service District 123</p> <p>Peggy Willcuts<br/> Senior STEM Consultant<br/> Pacific Northwest National Laboratory</p> | Creative Commons Licensing information                                                                                                                                                                                                                                        |



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Georgia Boatman  
Regional Science Coordinator  
Educational Service District 123

Peggy Willcuts  
Senior STEM Consultant  
Pacific Northwest National Laboratory