Appendix B: Complete rubric for assessing student work for data skills within Ocean Tracks-College Edition

All skill levels can be assumed to begin with the phrase “Based upon what is asked for in the question”

<table>
<thead>
<tr>
<th>Indicator</th>
<th>4 Exceeds Expectations</th>
<th>3 Meets Expectations</th>
<th>2 Needs Improvement</th>
<th>1 Inadequate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decoding Data (BDS1): Ability to read data or measurements from a representation or table</td>
<td>• Not applicable for this indicator</td>
<td>• Data table is completely filled in with completely correct values and units.</td>
<td>• At least half of the data table is filled in with correct values and units. Other entries may be blank or incorrect.</td>
<td>• Less than half of the data table is filled in with correct values and units.</td>
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<tr>
<td></td>
<td></td>
<td>• In a non-table answer, student correctly located and reported specific numeric value(s).</td>
<td>• In a non-table answer, student refers to data with a value, but it is incorrect.</td>
<td>• In a non-table answer, student does not use any specific numeric values.</td>
</tr>
<tr>
<td>Describing Data (BDS2): Ability to say what patterns or relationships are seen between data points</td>
<td>• Meets Expectations is satisfied AND one or more of the following:</td>
<td>• Description of the data pattern is accurate.</td>
<td>• Description of the data pattern is attempted, but inaccurate. (e.g., reports an increase when the data showed a decrease)</td>
<td>• Provides little or no description of data patterns at all.</td>
</tr>
<tr>
<td></td>
<td>• Comparison references specific data values beyond the scope of what is asked (e.g., makes magnitude and/or statistical comparisons)</td>
<td>• Makes quantitative comparison that includes reference to specific data values.</td>
<td>• Makes no quantitative comparison or reference to data values.</td>
<td>• Makes a qualitative comparison, but it is irrelevant to the scientific question.</td>
</tr>
<tr>
<td></td>
<td>• Creatively presents data visualization or uses more advanced tools to show a relationship between data points.</td>
<td>• Makes a comparison or describes a data pattern that is relevant to the scientific question</td>
<td>• Makes a qualitative comparison of a pattern that is relevant to the scientific question</td>
<td>• Provides a description that is a summary of background information without any evident use of OT data.</td>
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<td></td>
<td>• Appropriately uses scientific vocabulary</td>
<td>• Data visualization (including screenshot) are properly annotated with descriptions and/or comparisons, per instructions.</td>
<td>• Data visualization (including screenshot) is minimally annotated OR includes annotations that are incomplete or incorrect.</td>
<td>• Does not include a data visualization OR a visualization with no annotation at all.</td>
</tr>
</tbody>
</table>

*The only time a qualitative-only comparison can be scored a three is if the scoring*
| Interpreting Meaning in Data / Drawing Conclusions (IDS1): Ability to explain what data patterns mean or why they are important | Meets Expectations is satisfied AND one or more of the following:  
- Chooses examples of evidence that are expertly matched to the claim, interpretation, or conclusion  
- Reasoning for why evidence supports a claim is deeply explained (e.g., digs deeper into a dataset, demonstrating a higher level of sophistication than expected)  
- Provides information or evidence from primary sources  
- Considers the sample size and takes measurements from multiple tracks to increase confidence in the patterns identified | References multiple appropriate sources of evidence for the claim, conclusion, or interpretation made.  
- At least two sources of evidence from within OT are used.  
- Evidence used is relevant to the claim, conclusion, or interpretation that has been made.  
- Evidence is presented with specificity, not generalities.  
- Clearly articulates why the evidence provided supports a claim.  
Evidence may include: qualitative patterns or observations from OT data, quantitative measurements or patterns from OT data, background information from OT library, and/or other background information or knowledge | References at least one appropriate source of evidence for the claim, conclusion, or interpretation made.  
- Uses one source of evidence from within OT; if other evidence is used, it draws on background information.  
- Evidence is relevant to the claim, conclusion, or interpretation.  
- Evidence is presented more generally, without specificity.  
OR  
- Does not reference any OT data.  
OR  
- Evidence provided is irrelevant to the claim, conclusion, or interpretation.  
This includes “floating interpretations” that score well as a plausible claim being made, but that do not articulate support for the argument. |  
\[  
\] | Making Hypothesis Statements and  
| Meets Expectations is satisfied; AND additional  
| Poses a hypothesis or research question that:  
- Is specific. | Poses a hypothesis or research question that:  
- Is specific. | Poses a hypothesis or research question that:  
- Is vague or unclear. |
| Research Questions (IDS3): Ability to articulate a question or hypothesis that would generate new information or insight | mastery, including one or more of the following:  
- Writes a statement that, as described, is a clearly testable approach to answering a question or exploring a phenomenon  
- Questions or hypotheses show insight and high degree of understanding  
- Presents novel hypotheses or questions that show original thought beyond the direction of the prompts  
- Poses highly insightful questions about relationships that are not or are under-explored within the bounds of the curriculum  
- Strong use of appropriate scientific language (e.g., dependent and independent variable) | Involves at least one dependent and one independent variable (even if this terminology is not used)  
- Is bounded within the scope of either observed data within OT, theoretically observable data, and/or scientific concepts or principles  

Note: a hypothesis or question that is strong in these characteristics, but does not use highly scientific language, should still be scored a 3. | Has either a clear dependent or independent variable, but the other is missing or unclear.  
- May be fanciful or seem disconnected from scientific concepts or principles, including OT data. | Has no clear inclusion of dependent or independent variables. |

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### Critical Thinking about Data (CT1):
Ability to critically examine data sources and interpretations, including: data limitations, alternative interpretations, additional data needs, evaluating strength of a claim

<table>
<thead>
<tr>
<th>Meets Expectations is satisfied AND one or more of the following:</th>
<th>Note: rarely will more than one of these be asked for in a given question.</th>
<th>States a plausible, but unsupported, reason why a particular data source or data point may be invalid, unreliable, or should be questioned in some way; i.e., indicates some assumption that may be unfounded</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Separates factual information from inferences</td>
<td>- States a factual limitation of why a particular data source or data point may be invalid, unreliable, or should be questioned in some way; i.e., limitation comes from background information in OT or scientific knowledge / principles about the nature of that data OR Separates relevant from irrelevant data (e.g., identifies meaningful data vs. outliers or sampling artifacts; takes into account single track vs. larger dataset)</td>
<td></td>
</tr>
<tr>
<td>- Identifies MULTIPLE plausible alternative explanations or interpretations of data</td>
<td>- Attempts to provide an alternative explanation or interpretation, but explanation is not plausible or only vaguely explained</td>
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</tr>
<tr>
<td>- Shows proficiency in such thinking in questions where it is not specifically asked for.</td>
<td>- Names or suggests at least one other type of data or information to be used; but the suggestion is not relevant to the question, claim, or hypothesis that is being addressed</td>
<td></td>
</tr>
<tr>
<td>- Adds more specificity to the type of data or measurement that would be needed to address other points of view</td>
<td>- When evaluating strength of a claim or hypothesis, student uses minimal critical thinking indicators; OR only minimally uses OT data</td>
<td></td>
</tr>
<tr>
<td>- Identifies at least one plausible alternative explanation or interpretation for data or observations; explanation is fully explained and specific.</td>
<td>- Cannot or does not name other data sources that could be used; OR names sources that would</td>
<td></td>
</tr>
<tr>
<td>- Clearly names or describes at least one other type of data or information –</td>
<td>Does not demonstrate core skills of thinking critically about data when asked for:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Does not provide any plausible reasoning for why one might question a data source or data point</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Does not question (and may base interpretation on) a data point that is invalid or unreliable in some way</td>
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</tbody>
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| Communicating Ideas Effectively (CT2): Ability to clearly articulate thinking and ideas about data in writing | Meets expectations + demonstrates additional mastery. For example:  
- Uses consistent, high-level, sophisticated language and communication techniques  
- Uses advanced graphics or visualizations | Whether available within OT or not – that would further strengthen a conclusion, support a hypothesis, or refute a conclusion  
- When evaluating the strength of a claim or hypothesis, student uses critical thinking indicators OR strong use of OT data evidence to support their evaluation of strength, for instance:  
  o Look at data limitations  
  o Look at outliers  
  o Look at sampling | Evidence to support their evaluation of strength | Not qualify as valid data  
- When evaluating strength of a claim or hypothesis, student uses no critical thinking indicators; does not use any OT data evidence to support their evaluation |

| Communicating Ideas Effectively (CT2): Ability to clearly articulate thinking and ideas about data in writing | Meets expectations + demonstrates additional mastery. For example:  
- Uses consistent, high-level, sophisticated language and communication techniques  
- Uses advanced graphics or visualizations | Clearly articulates thoughts and ideas in response, so that meaning can be easily understood by an outside reader.  
- Uses complete, coherent sentences or paragraphs, punctuation, and appropriate citations.  
- Uses appropriate data visualization to support written communication of information, including graphs, tables, and annotated screenshots. | Articulates thoughts and ideas in response, but has some difficulty with clarity, making it more difficult for a reader to understand  
- Does not use complete, coherent sentences or paragraphs, punctuation, and appropriate citations.  
- Attempts to use data visualization to support communication, but may not be fully clear | Clarity of presentation of thoughts and ideas makes it very difficult, or impossible, for a reader to understand.  
- Does not use complete, coherent sentences or paragraphs, punctuation, and appropriate citations.  
- Does not use data visualization |
<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uses appropriate scientific vocabulary</td>
<td>Adheres to provided guidelines in the question, if provided (e.g., format, word count, etc.)</td>
</tr>
<tr>
<td>Does not use appropriate scientific vocabulary consistently in response; OR uses scientific language inappropriately (distracting from clarity)</td>
<td>Adheres to some, but not all, of provided guidelines in the question, if provided (e.g., format, word count, etc.)</td>
</tr>
<tr>
<td>Does not use appropriate scientific vocabulary at all.</td>
<td>Does not adhere to any provided guidelines in the question (e.g., format, word count, etc.)</td>
</tr>
</tbody>
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