Exemplary Assessment Commentary: Secondary Science

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1. Analyzing Student Learning
   a. Identify the specific standards/learning targets measured by the assessment you chose for analysis.

   [The high school I am working in uses the Washington state standards called the Essential Academic Learning Requirements (EALRs). However, they are working on moving to the national science standards called the Next Generation Science Standards (NGSS). Therefore, I found the appropriate standards from both.]

   **EALR 9-11 LS1F**
   All of the functions of the cell are based on chemical reactions. Food molecules are broken down to provide the energy and the chemical constituents needed to synthesize other molecules. Breakdown and synthesis are made possible by proteins called enzymes. Some of these enzymes enable the cell to store energy in special chemicals, such as ATP, that are needed to drive the many other chemical reactions in a cell.

   **EALR 9-12 INQB**
   Scientific progress requires the use of various methods appropriate for answering different kinds of research questions, a thoughtful plan for gathering data needed to answer the question, and care in collecting, analyzing, and displaying the data.

   **EALR 9-12 INQC**
   Conclusions must be logical, based on evidence, and consistent with prior established knowledge.

   **NGSS HS-LS1-1.**
   Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells.

   I don’t expect to see the students fulfill all of the above standards in their conclusions, but a good part of what they are learning here comes from each of the multiple standards. Here, the content they are learning is to see an example of an enzyme breaking down its substrate, much like enzymes in humans break down food in digestion. This is seen in standards ALR 9-11 LS1F, stating “food molecules are broken down” “by proteins called enzymes” and in NGSS HS-LS1-1, “proteins…carry out essential functions of life.” In this lab they see the effect of enzymes so that in later lessons, they can see why the effect of enzymes is important, finishing the content found in the standards.

   In order to reflect the parts of these standards needed for this lesson, my learning goals for Lesson 2, where they are to write the conclusion, are: “The students will be able to analyze data and use it to describe what is happening to sucrose on a molecular level”, “The students understand how to write a scientific conclusion using a “Statement, Evidence, Explanation” format”, and “the students will synthesize a conclusion based on data they
obtained in the lab.” The first learning target relates to the content seen in EALR 9-11 LS1F and NGSS HS-LS1-1, because the students should be able to see that the sucrose is being broken down into smaller molecules by the enzyme sucrase. The second and third learning targets are related to EALR 9-12 INQB and EALR 9-12 INQC, along with the first section of NGSS HA-LS1-1 when it mentions “Construct an explanation based on evidence for…” These are trying to get the students to be able to write effective conclusions based on data.

b. Provide the evaluation criteria you used to analyze student learning.

<table>
<thead>
<tr>
<th>CONCLUSION RUBRIC</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ATTRIBUTES OF A CONCLUSION</strong></td>
<td><strong>ATTRIBUTES</strong></td>
</tr>
<tr>
<td><strong>1. CONCLUSIVE STATEMENT</strong></td>
<td>1</td>
</tr>
<tr>
<td>Correctly answers the experimental question OR correctly states whether the hypothesis/prediction was correct</td>
<td></td>
</tr>
<tr>
<td><strong>2. SUPPORTING DATA</strong></td>
<td>2</td>
</tr>
<tr>
<td>Should be over the entire range of the conditions investigated.</td>
<td></td>
</tr>
<tr>
<td>Lowest and highest conditions if data is quantitative</td>
<td></td>
</tr>
<tr>
<td>Responding variable when the data is qualitative (1 point for having data, 2 points for a range of data)</td>
<td></td>
</tr>
<tr>
<td><strong>3. EXPLANATORY LANGUAGE</strong></td>
<td>1</td>
</tr>
<tr>
<td>Used to connect or compare data to the conclusive statement</td>
<td></td>
</tr>
<tr>
<td><strong>4. SCIENTIFIC EXPLANATION</strong></td>
<td>1</td>
</tr>
<tr>
<td>Provides a plausible scientific reason that explains the trend</td>
<td></td>
</tr>
</tbody>
</table>

The above rubric for a lab conclusion was taken from an old biology end of course (EOC) exam that the graders would use to grade students responses. The students in my class will have to take their EOC near the end of this year, and I wanted them to have the experience of seeing the requirements for writing a conclusion on their EOC. However, I also think the above conclusion is a valid rubric on its own as well. I told my students that it was necessary to practice with a rubric similar to what they will see on their EOC, but informed them that it is also scientifically valid. On other labs that I had been present for, many of the students had only discussed data that was specific to their point; they didn’t include a range of data. Therefore the second point was important for the students to understand. The first criterion was the conclusive statement. This simply gave the students points if they properly answered the question. On this note, I think my assignment was unclear. I had intended for the students to answer the purpose statement. When I gave my students the lab hand out, I had modified one of my mentor teacher’s lab procedures. At the bottom, there was a conclusion section that I had accidentally left, that stated: “Compare the results of test tube 3 to that of test tubes 1 and 2. How do you explain the results? (recall the results from yesterday’s lab?) What is the role of sucrase? Cite evidence from your data to support your explanation” (Lesson 1, p. 3). I had meant for my students to answer the question at the top of the lab that stated: “What is the effect of the enzyme sucrase on table sugar?” (Lesson 1, p. 3). I had stated this in front of the class, and that they could ignore the conclusion questions at the bottom, but some of my students didn’t hear me. If I did this again, I would take off the conclusion section at the bottom.
I made sure that when I graded the conclusions, I didn’t mark the students off if they had answered the questions at the bottom, though I noted it in my commentary to the students.

I also graded the students on their participation in the lab. I gave the students 10 points if they turned in their data table in the handout as long as it was filled out. I didn’t grade the students on whether their group got “good” data or not, just that they had recorded it. You will see two grades on the student work samples. One will be on the completed lab handout, and the other will be on the conclusion. I decided to grade the lab handout, because many of the students in the class had the habit of not taking data themselves, and then just copying their partner’s papers. By grading the lab data sheets, the students were required to take part in the lab, and pay attention better to what was going during the lab.

I also made mini copies of the rubric so I could show the students how they did on each section, and I taped the mini rubric to the conclusion sheet. The mini rubric is shown below:

<table>
<thead>
<tr>
<th>ATTRIBUTES OF A CONCLUSION</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. CONCLUSIVE STATEMENT</td>
<td>/1</td>
</tr>
<tr>
<td>2. SUPPORTING DATA</td>
<td>/2</td>
</tr>
<tr>
<td>3. EXPLANATORY LANGUAGE</td>
<td>/1</td>
</tr>
<tr>
<td>4. SCIENTIFIC EXPLANATION</td>
<td>/1</td>
</tr>
</tbody>
</table>

I then doubled the total points to make the conclusion out of 10 points as well. This was done because my mentor teacher weighted her assignments by their point value, and she made each of her labs about 20 points. In order to remain consistent with her grading system, I made completed data table out of 10 points, and the lab conclusion out of 10 points. Because I was trying to give the kids the experience of the standardized rubric they will see in the Biology EOC, I didn’t differentiate the lab conclusion grading aside from giving the students who needed extra time according to their 504 plans. In addition to extra time, these students were allowed them to come in and make up the lab if they missed it. Also, for the student who was ELL, I made sure to state the directions well, and to show them on the screen. I then walked through some example conclusions with parts missing and had the students go through them and use the rubric to state what was wrong. This seemed to be beneficial for all of the students, not just the student who was an English language learner. For the students who were high achieving, I still didn’t change how they were graded according to the rubric, but I tried to add more information to their comments, to show them how to write a conclusion at an even higher level. My focus student with a special learning need is one of the high achieving students. This student’s conclusion is seen in Student 3 Work Sample. To show what I mean, you see that she received a full score on her conclusion, but that I tried to push her even further. The extra tips I gave her include “It’s good to have your conclusion statement a bit more clear [and] save data for later” (Student 3 Work Sample, p. 2) and “It would be good to discuss [test] tubes 4 and 5 as well and how they relate” (Student 3 Work Sample, p.2). This shows that I was trying to get her to think of how to improve her conclusion, even though she received full credit for the conclusion she wrote. I also tried to, like all of my commentaries, show the students what they did well. In Student 3 Work Sample, on p. 2, I made sure to note that she had a great demonstration of her logic in her scientific explanation when she said “Although we know that table sugar is a disaccharide, so the color change shouldn’t have occurred…[however, because] it did change color, it tells us that sucrose broke up the table sugar into a monosaccharide causing the indicator to show up…[so]…we can conclude that the role of sucrose is to break down sucrose” (Student 3 Work Sample, p. 2).

c. Provide a graphic (table or chart) or narrative that summarizes student learning for your whole class. Be sure to summarize student learning for all evaluation criteria described
above.

[ The majority of the students who turned in their conclusions got a full score. However, only nineteen out of twenty nine students turned in the lab conclusion. Eleven out of the nineteen people received full credit for their conclusions. Six out of the nineteen people who turned in their conclusions received an eight out of ten. Five out of six of these students missed the points for the “conclusive statement” section of the rubric. These students started their conclusion talking about their data without giving a concrete statement to start the conclusion. One of the six students who received an eight out of ten score missed the scientific explanation, meaning that these students connected their data to their statement, without giving a scientific explanation as to why. There was one student in the class with a score of six out of ten. They missed points because they didn’t write a conclusive statement or their scientific explanation for why the data supports their findings. One other student only included data in his conclusion, and his statement only talked about the color changes witnessed, and didn’t discuss what the colors meant. His work is found in Student 2 Work Sample. I mentioned that he had good data, but that I wanted him to go a little further with what that data meant.

Overall, the students did well on the assignment and seemed to understand the fact that Benedict’s solution indicated for the presence of monosaccharides when sucrose and sucrase were put together but did not indicate when each solution was by itself, and that said fact meant that sucrose was broken down into monosaccharides by the enzyme sucrase. Only two students of those that handed in their assignments seemed to miss this. The other seventeen students only lost points because they either didn’t state their conclusive statement clearly or it was missing altogether. This means that the majority of the students did well on the first learning objective for Lesson 1, which states: “The students will be able to analyze data and use it to describe what is happening to sucrose on a molecular level.” The second and third learning objective is where the students might need more help, as eight out of the nineteen students seemed to miss how to correctly give a conclusive statement. The learning objectives they will need help on are: “The students understand how to write a scientific conclusion using a ‘Statement, Evidence, Explanation’ format” and “The students will synthesize a conclusion based on data they obtained in the lab.” However, every student did a good job giving a range of data. In previous labs, students often gave one piece of data and based their conclusion on that one piece. But, in this lab, every one of the students gave a good range of data. A few of the students didn’t discuss test tubes 4 and 5, which were meant to show the specificity of sucrase to sucrose, but the conclusion didn’t ask for this, so I didn’t mark them down. However, in most of my comments, I did mention to the students that it is good to include all data if they are able to. An example of this is in Student 1 Work Sample, where I told the student to “include all data, including tubes 4 and 5, and how they relate to the lab” (Student 1 Work Sample, p. 2). As long as the students talked about test tubes 1, 2, and 3, they got full credit for showing a range of data, even if they didn’t include all of the data.

I am not yet sure why ten out of the twenty-nine students did not turn in their conclusion. I had told them that I was available to help before and after school, and during lunch every day, I had given a make up lab, but none of the students from this period attended. I also accepted late work. My only explanation is that during the week when we did the lab, there was also standardized testing for reading and writing that all tenth graders had to do. They may have been distracted during the teaching and didn’t understand, and then felt like they couldn’t make it in to ask for help. I regret that I didn’t ask for a poll or for the students to tell me why they hadn’t turned it in. I only heard from a couple of the students as to why they hadn’t turned it in, and their reason was that they just hadn’t gotten to it yet. I think in the future, if this many of my students haven’t turned in an assignment, I will be sure to have some kind of poll, or short response that each student turns in to me as an exit ticket, so that they can tell me confidentially why they didn’t turn it in.]


d. Provide a graphic (table or chart) or narrative that summarizes students’ understanding of their own learning progress (student voice).
[When I graded the students’ conclusions, I made several comments to the students on how they did on the conclusion. I stated things like “great data, but I would like you to go deeper as to why that data means something.” I then had those students who had turned in their conclusions write a reflection on my commentary and see if they thought it would help them, and if they thought they could do better in the future. Of the nineteen students that turned in their conclusions, most of them said that the comments would help in their future conclusion writing. The student from Student 2 Work Sample who received a four out of ten on his conclusion reflected that he was confused by the lab and didn’t know what to answer (Student 2 Self-Reflection). On later assessments, however, he showed greater understanding. Many of the other students stated that with the feedback and the rubric, they could write a better conclusion in the future. My hope was to prepare them for the Biology EOC, and for them to become more proficient at writing conclusions based on data. This is seen in the second and third learning targets in Lesson 2, when they state: “The students understand how to write a scientific conclusion using a ‘Statement, Evidence, Explanation’ format”, and “The students will synthesize a conclusion based on data they obtained in the lab.” The students seemed to be progressing along this path, as many of the students did well on the conclusion, and the ones that needed further help (those that didn’t get a perfect score), mainly needed to improve on writing their conclusive statement. Many of the students reflections noted this as well and said that they know what they did right, and what they need to improve on.]

e. Use evidence found in the 3 student work samples and student self-reflections, and the whole class summary, to analyze the patterns of learning for the whole class and differences for groups or individual learners relative to conceptual understanding, use of scientific practices during inquiry, and evidence-based argument about a scientific phenomenon

[Many of my students seemed to have solid conceptual understanding. Most of the students that turned in their assignments received full credit on the rubric for their scientific explanation and explanatory language. These sections of their conclusions were to have them connect the data they saw in lab to support their statement, and for them to have a valid, scientifically plausible explanation for why their explanatory language is correct. For the nineteen students that turned their conclusion in, seventeen of them seemed to understand this—examples seen in Student 1 Work Sample and Student 3 Work Sample. In Student 1 Work Sample, the student stated “the reason for this reaction was sucrase. Sucrase broke up the sugar changing it from a disaccharide to a monosaccharide. This caused the substance to change colors.” Here we see that the student seemed to understand that Benedict’s solution indicating positive meant that monosaccharides were present, and that the sucrose must have broken down the sucrose into monosaccharides. We also see in some of the reflections that students are understanding the concepts. For example, one of the science concepts the learning targets are trying to promote is that a conclusion must be evidence based. This comes from the learning target that states: “The students will synthesize a conclusion based on data they obtained in the lab” (Lesson 2, p. 1). The student shows an understanding of this concept in her reflection when she states “I need to talk about all the data including test tubes” (Student 3 Self-Reflection). We see here that she understands that her conclusion must be supported by data from the lab.

To show evidence for the use of scientific practices during inquiry, we will again look at the class data, and then at individual conclusions and commentary. We see here that overall the students seemed to understand science practices we used during our inquiry in this lab. From the class data, we see that a majority of the students seemed to understand that there was more than just one data point, that test tube 3 turned orange. Seventeen out of nineteen of the students understood that that you needed more data to make sense of what was going on. The science practice represented here is that in order for scientists to make quality conclusions about their inquiries, they need to have negative control groups. In this lab, we saw that neither test tube 1 with only sucrase, and test tube 2 with only sucrose, caused the Benedict’s solution to indicate positive and turn orange. Only when the two were combined did we see indication of
monosaccharides. The class seemed to overall understand that these negative control data points were important because seventeen out of nineteen included the range of data in their conclusions. However, there were only a few that really explained why they were important. To look at the student work samples, we see that in Student 1 Work Sample and Student 2 Work Sample, the students included the data points but didn’t explain why they were important. One off these students stated “test tubes 1 and 2 didn’t change” (Student 1 Work Sample, p. 1). Only one of the student's samples here stated why. She said that that in test tubes 1 and 2, the color remained blue, which “tells us that monosaccharide was not present” (Student 3 Work Sample, p. 2). The two students who didn’t get this practice to the full extent also didn’t include it in their reflection. For example, in Student 1 Self-Reflection, we see the student reflected that they knew what they had to change, but didn’t go into further detail. Here we see that the students do understand that a full data range is important, and did include it in their conclusion. But they didn’t necessarily show that they understood how that range of data shows us something interesting. This will be something I plan to discuss with the class next and try to give them further chances to try this scientific practice.

In my analysis, I found that all of the students were able to create an evidence-based scientific argument. Again, seventeen out of the nineteen students that turned in their assignments got credit for their scientific explanation. As stated above, they may not all have explicitly said why the negative control points stayed blue, but they did state their range of data, and stated how test tube 3 turning orange showed that sucrase was breaking down sucrose because it indicated for monosaccharides. Two of the students seemed to have a hard time connecting their data to an evidence-based argument. One example is in Student 2 Work Sample, where the student only discussed how the test tubes changed or did not change color. He wasn’t able to connect the color change to anything taking place on the molecular level. He also stated in his reflection that he wasn’t sure which questions to answer or if he had enough data to answer the questions, so he guessed (Student 2 Self-Reflection). With this student and the other who had trouble with the scientific explanation, I would plan on trying to schedule some time with them to go over what they might have missed, and what was happening in the lab.

2. Feedback to Guide Further Learning

Refer to specific evidence of submitted feedback to support your explanations.

a. In what form did you submit your evidence of feedback for the 3 focus students?

Written directly on work samples or in a separate document

b. Describe what you did to help each focus student understand his/her performance on the assessment.

[To help each of the students, first I gave them an image of a mini rubric so they could see how their score broke down across the EOC rubric I had given them. You can see this on Student 1 Work Sample, the student received full credit on her supporting data, explanatory language and scientific explanation. Student 2 Work Sample shows that this student only received credit in the supporting data section of the rubric. In Student 3 Work Sample, the student received full credit in all categories on the rubric.

The second, and more important way I helped each focus student understand his/her performance on this assessment was by making comments. In Student 1 Work Sample, I let the student know that they needed a “statement in answer to the conclusive question” (Student 1 Work Sample, p. 2) I also let them know that the conclusive statement is often found at the top of a conclusion this short. This was to help them write things clearly in their conclusions, especially if they have to write a lab conclusion on their Biology End of Course (EOC) exam. I also mentioned to the student that she should include data from test tubes 4 and 5 how they
related. Not including test tubes 4 and 5 but including the rest of the range of data still allowed the students to receive the full points, but they should try to include all applicable data and how it either related, or was scientifically unusable. I then went on to tell her what she did very well. This was mainly focused on her succinctness. I felt that she answered the question (though without the conclusive statement) in a manner that used a minimum amount of words, while still covering everything she needed to say. In scientific writing, to be able to write clearly without overstating things, or using flowery language is a good skill to have, and I wanted to let her know that she did this well. For the student’s work shown in Student 2 Work Sample, I talk more about how their data was well done but that I wanted him to go further with the data and give what the data means for the purpose of the lab. I also mentioned, but didn’t take points off, that his conclusion should have been typed according to the directions given in class. His was written by hand at the bottom of his data sheet.

The student whose work is seen in Student 3 Work Sample, is my special needs focus student. She is one of the high achieving students in the class, and needs accommodations to make sure she remains engaged and academically stretched during the lesson. She received a 100% on her conclusion score, so some of my comments were to help her further her understanding and conclusion writing skills. For this particular student, I mentioned to her that while her conclusion was well done, there were ways to make it more clear. I told her to wait to give her data until later in the conclusion, and just state her response to the purpose statement in the conclusive statement section of her conclusion. This should help her receive better scores on future conclusions because it will help her to become more clear so the reader can follow easily. I also mentioned to her, as I did for the student in Student 1 Work Sample, that it would be good for her to include data from test tubes 4 and 5 in her conclusion and how they related to the rest of the data. I also mentioned some things she did really well, which included her demonstration of her logic in her scientific explanation. She had logically broken down her scientific explanation when she stated that “Although we know that table sugar is a disaccharide, so the color change shouldn’t have occurred…[however, because] it did change color, it tells us that sucrose broke up the table sugar into a monosaccharide causing the indicator to show up…[so]…we can conclude that the role of sucrose is to break down sucrose” (Student 3 Work Sample, p. 2). I made sure she knew that it was well done, and boxed the section of her conclusion where the above quote is expressed]

c. Explain how feedback provided to the 3 focus students addresses their individual strengths and needs relative to the standards/learning targets measured.

[For this lesson, the learning targets were as follows: “The students will be able to analyze data and use it to describe what is happening to sucrose on a molecular level”, “The students understand how to write a scientific conclusion using a ‘Statement, Evidence, Explanation’ format”, and “The students will synthesize a conclusion based on data they obtained in the lab” (Lesson 2, p. 1). For the student focused in Work Sample1, the student’s specific needs were more for the second and third learning targets that had more to do with writing a conclusion, then for knowing science content. She therefore needed more focus on the following standards: EALR 9-12 INQB and EALR 9-12 INQC, along with the first section of NGSS HA-LS1-1. I tried to focus on her conclusion writing in my commentary. For example, I mentioned that she needed a “statement in answer to the conclusive question (purpose)” and that it “is usually found at the top of a conclusion this short” (Student 1 Work Sample, p. 2). I also tried to help her in this area by saying how she did a good job on the clarity and succinctness of her data and scientific explanation. This also helps her to see where she is doing well on the standards above mentioned.

For the student focused in Student 2 Work Sample, he seemed to have trouble with content. This student had said himself in his reflection that he wasn’t sure which questions to answer, or how to answer them. I therefore mentioned to him that he had good data, but that I wanted him to go deeper with what that data meant. Therefore, my comments to him focused more on the first learning target and the following standards: EALR 9-11 LS1F and NGSS HS-LS1-1.
The student focused on in Student 3 Work Sample was a high achieving student. I thought she did very well with the content and I told her that her scientific explanation was very well laid out and logical. This meant to me that she was competent at the more content based learning targets and standards. I therefore focused on the conclusion writing learning targets, along with the following standards: EALR 9-12 INQB and EALR 9-12 INQC, and the first section of NGSS HA-LS1-1. Because she was a high achieving student, I wanted to be sure to let her know what she could do above and beyond to make her conclusion writing grow, even though she received full credit on the conclusion she wrote. This mainly focused on making her conclusive statement more solid, and to not include data. I told her that data should be included in a different section, and that her conclusive statement would be better off more clear and concise. I also mentioned as I did to many or the students that she should include data from test tubes 4 and 5 in her conclusion, because it is best to include the rest of the data and how it relates to her conclusive statement.

d. How will you support students to apply the feedback to guide improvement, either within the learning segment or at a later time?

[ In order to support my students in Student 1 Work Sample and in Student 3 Work Sample in applying their feedback, I will give them further chances to write lab conclusions based on the Biology End of Course Exam rubric. They received good scores on their labs, and will most likely improve after multiple chances to practice on other conclusions. This will help the student focused in Student 1 Work Sample to be sure to include a conclusive statement, as well as try and include all appropriate data into her conclusion. Practice will also help the student focused on in Student 3 Work Sample. This student can practice writing their conclusive statement more clearly, and saving their data for a later point in the conclusion. As these two students work through future conclusions, I will help them to see further areas where they can improve and become more proficient conclusion writers, by commenting each time and allowing them to receive the feedback before writing another conclusion. This will help the students to grow in their proficiency of the following standards as they move to the end of the year: EALR 9-12 INQB and EALR 9-12 INQC, along with the first section of NGSS HA-LS1-1. This will also help them to do better on their Biology EOC towards the end of the year. And for the student focused on in Student 3 Work Sample, because she is a high achieving student, I will try to give her a higher level of feedback than the EOC rubric is asking for so she can continue her skills at writing conclusions.

For the student focused on in Student 2 Work Sample, he would also benefit from future conclusions to write, because he didn’t get full credit on conclusive statement, explanatory language, or his scientific explanation. He did included a range of data, he just didn’t seem to know what the data meant. This points to a problem that will need to be addressed in the learning segment, because he needs work on the following standards: EALR 9-11 LS1F and NGSS HS-LS1-1. These are more content-based standards. One option will be to work out a time where this student can come in outside of the normal period, where I make myself available before and after school, and during lunch, so we can go over the content he is stuck on. He stated in his reflection that he wasn’t sure which of the questions to answer, nor was he sure how to answer the ones he did attempt. The other option, if he can’t make it in, is I can give him some reading on the topic so he can learn about the content at home. I may also let him have a second chance at writing this conclusion once he is more confident with the material. This is because it is hard to accurately measure someone’s conclusion writing abilities, when that person doesn’t understand what they are writing about. Once the student is more confident with the material, a conclusion rewrite will show better how well he is doing on the following standards: EALR 9-12 INQB and EALR 9-12 INQC, along with the first section of NGSS HA-LS1-1.]

3. Evidence of Language Understanding and Use When responding to the prompt below, use concrete examples from the video clips (using time-stamp references) and/or
student work samples as evidence. Evidence from the clips may focus on one or more students.

[There were several opportunities where students were able to practice vocabulary and language functions through discourse. From the Student 3 Work Sample, we see an example of a student being able to practice their vocabulary. In her conclusion, the student used discourse though writing to practice with words like enzyme, monosaccharide, disaccharide, sucrose and sucrase. The student used all of these vocabulary words when she was writing her conclusion during Lesson 2. This also gave the students the chance to explain, with evidence, why Benedict's solution indicates for monosaccharides when sucrose and sucrase are put together. We see the same discourse happening to explain this phenomenon, and the vocabulary is used as part of the evidence. Another example comes from Student 1 Work Sample, where the student mentions that "sucrase broke up the sugar changing it from a disaccharide to a monosaccharide" (Student 1 Work Sample, p. 2). She is using vocabulary words like monosaccharide and disaccharide as part of her evidence to explain the phenomenon being investigated.

Another example where the students are able to use discourse to discuss specificity in enzymes is seen in Video 3 from task 2. At 0:47 – 1:09 seconds, we see students who are using vocabulary in discussion. They are responding to prompts which ask them to discuss how they learned the material from Lesson 3, and how they thought they would do if they had to recall the information. We see in this example a male student in a blue shirt struggling through some vocabulary using discourse. He discusses specificity with another classmate and states: "Specificity is um ...[girl with red hair mentioned something, and then boy with blue shirt continues]...the active site is shaped perfectly, it has to, and can’t fit into anything else, so that’s why its specific to that active site, the substrate." Here we can see an example of a student having the chance to express his understanding of the concept of specificity, using vocabulary words like active site and substrate. By getting the chance to talk and write about what they are learning, they have an opportunity to see what exactly they know and how well they know it.]

4. Using Assessment to Inform Instruction

a. Based on your analysis of student learning presented in prompts 1c–e, describe next steps for instruction to impact student learning for the whole class and for the 3 focus students and other individuals/groups with specific needs

[ The next step after the analysis of the lab conclusion from lesson 2, is me asking the students for an exit ticket as to why they didn’t turn in their lab conclusions, as ten of the twenty-nine students did not turn it in. Once it is determined that the other students got the content, the next steps were to have the students continue the unit, and after the test, move on to discuss a new related topic, feedback mechanisms. This unit will feed off of Lesson 5, where we learn how enzymes and proteins are regulated by the body.

For the students with 504 plans, they may need more time before they are ready to move on. From the analysis, I know that I will have to check in with them individually to be sure they have understood all of the content and have passed the rubric for their conclusions. For the English language learner, I will need to meet with her to be sure she understands everything as she should. This may be just a small conversation after class to try to ascertain where she is at. For the high achieving students, represented in this analysis by Student 3 Work Sample, they all seem to have done well on their conclusions, and were informed as to how they could do better in the future, even though they got full credit. They will need further practice at writing conclusions to challenge them to be better. This includes the student focused in Student 3 Work Sample.

The next step for the student focused in Student 1 Work Sample is to continue with the unit, and practice their conclusion writing so they can get a ten out of ten on the next conclusion. The student focused in Student 2 Work Sample will need further one on one help to be sure he has the content needed to continue in the unit and beyond into the next unit. ]
b. Explain how these next steps follow from your analysis of student learning and their self-reflections. Support your explanation with principles from research and/or theory.

[Bruner and Vygotsky’s theories on scaffolding are what prompted me to determine the next steps I plan on taking, seen in the answer to the previous question. The theory of scaffolding states that a teacher needs to build supports for new material, and those supports must be founded on past knowledge. Vygotsky added the concept of “zone of proximal development”. This is the area in which a student has enough supports to accomplish the learning, but not so much that they student isn’t stretched and challenged. In order to have proper supports going forward to new content, you need to be sure the students understand the current content. For this reason, when looking at the whole class analysis, I want to wait before I move on, because ten out of twenty nine students didn’t turn in their conclusions. It is important for me to be sure these students have the required content before moving on to new content in the next unit. Once I can see that these ten students have the necessary knowledge and skills found in the learning objectives, we can move on to finish the unit and move into the next one, because seventeen out of the nineteen students that turned in their conclusions seemed to understand the scientific concepts well enough to move on. The two students who didn’t quite have that content will need to speak to me before or after school, or during lunch to ensure they understand. I will do this same thing for the student who is an English language learner and the students with 504 plans. As there are so few of them, meeting on a one on one basis won’t be very hard. For the students who are high achieving, they seem to have the proper content to move on, so in order for them to stay challenged, I may come up with another activity for them if those ten students all need extra teaching. According to the class analysis, there were several students who just missed points on the rubric section for the conclusive statement. For these students, as well as the high achieving students, conclusion writing will need further practice to improve. I will plan more labs, and more opportunities for the students to practice their conclusion writing skills, so they can have a chance to take the comments I gave them and try to improve their conclusion writing.

For the student focused on in Student 1 Work Sample, and the high achieving student focused on in Student 3 Work Sample, both have the content to move on through the unit and on to the next one. Their scaffolding will be grounded in the learning they had in this lesson, and measured in the lab conclusion assessment. The student focused on in Student 2 Work Sample will need further help. He will be one of the students who will need further support on this topic before moving on to the next. This may involve staying late and talking with me about what he may be missing. It may also be an extra practice worksheet so that he can practice the concepts at home. This will build up his skills so that the future support scaffolding that Bruner and Vygotsky talk about will be grounded in the knowledge obtained from this Lesson 2, and the rest of the lessons to follow, along with the knowledge tested for in the conclusion assessment discussed here.]