Lab Report Critiques - Learning from Others

Objective: Your task is to learn from other examples of lab reports for 8th grade science. The idea is not to criticize the student’s work, but to learn how to prevent mistakes in your own reports for this class.

ATL Skill: Communication - Give and receive meaningful feedback

TEKS: 3A in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student

Instructions:

1. Look over the Model Lab Report Critique and the Lab Report Template to learn how to critique a lab report.
2. On the Lab Report to Critique - Use the boxes provided to put your questions or comments about that section of the lab report.
3. In the space below, answer the questions.

What you learned:

1. What were some key “take aways” that you learned from this assignment?

2. What are steps that are often left out or off of a data table or a graph?

3. Why should a procedure be numbered?

4. What are the key steps or paragraphs in a conclusion?
Model Lab Report Critique: Teacher has commented in boxes to the side, on a student report so that you have an idea of how to do this task!

Explanation of the Oil Spill Lab – students were given the task of cleaning up an “oil spill” in a laboratory setting. This lab experiment replicated the efforts of engineers to clean up large oil spills in the ocean. Students designed a prototype and then tested its effectiveness.

Oil Lab Investigation

The problem we were faced with in this investigation was the dangers of oil spilt in our ocean, and how we can change the environment around us. Once oils are in our ocean, it is a very difficult and expensive process to remove these. Our goal in this project is to find productive and simple way to rid our oceans of harmful pollutants that are causing a negative effect on our marine life. We intend to test which materials soak up the most oil and least water to extract the maximum amount of oil from our simulated oceans. The experiment planned might not be completely effective, but will provide insight as to which materials might help with the overall oil clean up.

Question at hand: Which materials prove to be more effective to soak up the maximum amount of oil and the minimum amount of water?

Hypothesis: If the material has a higher density then it will be able to soak up more oil due to the low density of the oil.

Variables

Independent: Materials we are using
Dependent: The amount of oil absorbed
**Materials:**
- Water
- Cooking Oil
- Sponge
- Paper towels
- Tulle
- Polyester Cotton
- Styrofoam

**Procedure**

**Step 1:** Measure out the oil and water into a beaker for the experiment, 100 mL of water and 50 mL of oil.

**Step 2:** Use one material to soak up the top layer of oil, trying not to come in contact with the substance in case it might mess the experiment up.

**Step 3:** Measure the remainder of the contents and record the data using the markings on the beaker.

**Step 4:** Thoroughly clean-up the beaker in order to ensure further trials are unaffected.

**Step 5:** Repeat steps 1-4 with all the remaining experiment, and make sure to keep detailed notes for the recording of your data.

**Materials** – no exact amounts are listed for the materials. What containers or the size of those are listed. Why would the group use Styrofoam, it’s toxic to sea life and doesn’t biodegrade. Not a good source for an environmental experiment.

**Procedure** – “step” is not necessary, simply numbering is acceptable.

1. States to measure out oil and water, but doesn’t say to do it in separate containers.
2. “Use one material” is confusing – what material, which material, how much material – are all good questions. I don’t understand what the second part of sentence is trying to explain.
3. It is not clear in step 3 when it stated “measure the remainder of the contents” – where are the contents? Still in the beaker, or are they somewhere else now?
4. Why is there a need to reuse the same beaker? Would the results be better if several were used?
5. Step 5 is fine, except that other steps are not very clear.
Qualitative data:

When doing the experiment we noticed the oil always stayed on top of the water due to its lower density. We also took note that the materials that were tightly packed and less porous soaked up more of the oil. For example, the polyester cotton only had few gaps in it and successfully soaked up the oil. Also the sponge was less porous than a lot of the materials and soaked up a majority of the surface oil. Our predictions were right for the most part, this is because we guessed which materials would have the biggest intake of oil, and our predictions came close to the actual experiment. One thing we were very surprised by was the polyester cotton. This surprised us because we predicted only a little oil to be soaked up and a small amount of water, when in reality, all the oil was taken in.

<table>
<thead>
<tr>
<th>Material</th>
<th>Water (before)</th>
<th>Oil (before)</th>
<th>Water (after)</th>
<th>Oil (after)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sponge</td>
<td>100mL</td>
<td>50mL</td>
<td>100mL</td>
<td>20mL</td>
</tr>
<tr>
<td>Polyester cotton</td>
<td>100mL</td>
<td>50mL</td>
<td>100mL</td>
<td>0mL</td>
</tr>
<tr>
<td>Paper towel</td>
<td>100mL</td>
<td>50mL</td>
<td>100mL</td>
<td>25mL</td>
</tr>
<tr>
<td>Tulle</td>
<td>100mL</td>
<td>50mL</td>
<td>100mL</td>
<td>45mL</td>
</tr>
<tr>
<td>Styrofoam</td>
<td>100mL</td>
<td>50mL</td>
<td>100mL</td>
<td>50mL</td>
</tr>
</tbody>
</table>

Quantitative (Raw Data) – No title to the table? This is a big mistake! Based on what is in the table, I can discern what the difference between the “before” and “after” columns. More descriptive table column headings would have cleared this up. Or perhaps even a description underneath explaining the data. The collected data is also exactly on the tens or fives in measurement. This is hard to believe. Common mistakes on data tables and graphs are to leave off titles and labelling variables clearly and accurately.
Conclusion

Overall the experiment gave us good insight as to what materials aid in extracting oil from clean water. We used different materials, such as sponge, polyester cotton, paper towels, tulle, and styrofoam, to determine which one could soak up the most oil and help clean up polluted ocean. We did this by starting with 100 mL of water and 50 mL of oil, and the submerging each material and taking measurements of the remaining product. Our original question, “Which materials prove to be more effective to soak up the maximum amount of oil and the minimum amount of water?”, was answered through the results of our experiment. For example, none of the oil remained after the polyester cotton was submerged, which did answer our questions, and we found that it was the best of the materials tested to soak up oil out of and oil and water mixture. This answered the question because it proved which material collected the most oil.

Our final results were that the polyester cotton was what best worked to soak up the maximum amount of oil, because it soaked up all the oil in the beaker, of course this might not be 100% accurate in a real world scenario. The second most helpful material was the sponge, which soaked up 30 mL of the oil, and left 20 mL, this wasn’t surprising seeing as sponges are made to soak up liquids. Our third most useful material was the paper towel, which soaked up 25 mL of the oil, again, this was not that surprising seeing as paper towels are meant to absorb liquids. Next was the tulle, which only soaked up 5 mL of oil, and seeing as the tulle has large holes, this didn’t come as a surprise to many of us. Lastly, the styrofoam did not soak up any of the oil, therefore being the least effective of the materials, and again, living up to our predictions.
After conducting our experiment, we can’t support our hypothesis, mainly because the amount of oil soaked up really did not depend on the density of the material at all. Even though our hypothesis was not supported in any way, the experiment still really helped us with determining the material most helpful for oil clean-up (or at least out of the tested materials). We also couldn’t justify the hypothesis because our materials caused multiple variables because they weren’t all the same size, and that caused differences in density, which was what the hypothesis was about. Despite it being slightly biased and off track from the hypothesis, it still did help answer the main question and problem at hand. This is because, despite the correlation from the experiment to the hypothesis, we were still able to find effective ways to separate the oil from the water and clean up oil “spills”.

The experiment that was done had many flaws and could have possibly biased the experiment. The first major flaw in the experiment was that not all the materials were the same size, which created another variable that possibly skewed the experiment. Another thing that could have been improved was because of the difference in measurements, the density didn’t really matter as much, so the experiment was irrelevant to the hypothesis. If it was don again, the hypothesis should be changed to better. Also next time, we should ensure that there are no excess variables, such as size and weight for the materials.

### Overall Teacher Comments

This lab report would earn a solid 5-6 on the IB rubric. Why is that?

1. Language used in the paper is a little too conversational, needs to be more formal. Several times there were either spelling or grammatical mistakes.
2. Large gaps of understanding show in materials and procedures sections.
3. Why are there not any pictures included? That was encouraged with this assignment!
4. Data table could have been much better. This is what scientist use to communicate their raw data. If your data is in question, your experiment is for naught. No one will accept your results.
5. Communication in the conclusion could have been better. Once you have gone through the process of completing an experiment, your job as a scientist is to communicate those results to further the understanding of our world!
Title: (make this concise and interesting)

Introduction: (A few summary sentences about the problem (researched), what you intend to create and why you think it will work)

Question (The question that you are attempting to answer):

Hypothesis: (must be an “if …. then” statement)

Variables: (List and explain your variables)

   Independent – (x axis):

   Dependent – (y axis):

Materials: (provide a list of all materials used, measurements of each too)

Procedure: (Write the procedure your group followed. Be as specific as possible. Think about how difficult it would be to follow a recipe, but the writer doesn’t include supplies to use or amounts?)

Qualitative - Observations: (what happened that you expected, what happened that you didn’t expect?)

**Pictures with captions go in this section. Strongly encouraged for this lab!
**Quantitative - Raw Data:** Add a title and identify the data collected. This is an example table, make your own.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

**Conclusion:** **This information is also in your instruction packet!!**

Use these questions to help guide you in writing your conclusion.

- How much of the original spill was your group able to recover?
- What happened to the oil that was not recovered and was left?
- How effective was your prototype? Can you quantify this?
- How would you approach this problem again (lessons learned)

**Conclusion:**

Your conclusion should have the following paragraphs:

1. Write a summary paragraph on your experiment and the device your team built to tackle the task of cleaning up an oil spill. Explain how you think this device would answer the experiment’s main question.

2. What were the results collected? (Summarize your collected data and observations – give specific examples of the data and explain what the data shows). This is a good place to answer some of the above analysis questions!!

3. How was the hypothesis supported by the data? State the hypothesis and include data to demonstrate how you know that the hypothesis was supported or not supported.

4. Don’t give the procedure again, but do point out possible sources of error that may have occurred in the collection of data and suggest improvements. What were the lessons learned? Again, answer some of the above questions from the analysis questions section.

**TIPS for a successful lab report:**

1. Explain thoroughly the reason for the lab experiment.
2. Read through the Oil Spill Investigation Packet for guidance and the scientific language to use in your report.
3. Use the resources posted on Mrs. Thomas’s website to help you
4. Explain in detail in the conclusion. Don’t assume the reader knows anything!!
OPERATION OIL SPILL

Question: Will any of the materials help get rid of all the oil in the pan so that only water is left over?

Hypothesis: If multiple items are put in the same pan as the oil is in, then the oil will be completely soaked up or dissolved leaving only water.

Materials:
- Baking Soda
- Cooking Oil
- Cotton Balls
- Sponge
- Vinegar
- Yarn

Procedure:
Step 1: Pour cooking oil and water into the plastic container
Step 2: Put the sponge into the container for 1 minute so that it can soak up as much oil as it can.
Step 3: Then take sponge out and squeeze the contents into beaker to measure how much oil was sucked up.
Step 4: Input information into the data table
Step 5: Repeat step 1-4 with 10 cotton balls
Step 6: Repeat step 1-4 with yarn

Step 7: Repeat step 1, 2 and 4 with baking soda and vinegar

<table>
<thead>
<tr>
<th>Items:</th>
<th>Oil Cleaned Up:</th>
<th>Time:</th>
<th>Data table:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sponge</td>
<td>The sponge did not soak up any oil, and it only soaked up water. The sponge was made with chemicals as well, which means that it wasn’t made to soak up oil. Only water.</td>
<td>1 minute</td>
<td></td>
</tr>
<tr>
<td>Cotton Balls</td>
<td>The cotton balls picked up a combination of half oil and half water. We could tell because the beaker we emptied the cotton balls into the beaker it was greasy and had oil suds in it. 75 ml of oil was put into the pan but only about 15% of the oil was taken out. We think it was because the cotton was so compact into a ball. Plus when we put the cotton balls into the pan they sunk to the bottom where the water was so that would make sense to why mostly water was soaked up. The compact cotton balls were too dense to float on top of the oil.</td>
<td>1 minute</td>
<td></td>
</tr>
<tr>
<td>Yarn</td>
<td>The yarn only soaked up the oil. We were able to get a good amount of oil from the container. When we went to clean it up in the end, it there was about a centimeter or two of cooking oil cleaned up, and almost no oil in the pan. This would be a good solution because the yarn is cotton and organic and if it was constantly moving around picking up oil then it wouldn’t harm the environment or let animals choke on it or eat it. About 50 ml of oil was taken out of the pan and we put about 75 ml into the pan. Think this worked better than the cotton balls because the yarn was lighter and was in a different shape. Plus by trailing the string around on top of the oil it was able to pick it up. This method reminded me of the controlled burning method because in controlled burning there is a large net like rope that gathers the oil in one large spot and they burn it. Though when we used the yarn we didn’t burn it, we extracted the oil from it.</td>
<td>2 minutes</td>
<td></td>
</tr>
<tr>
<td>Baking Soda and Vinegar</td>
<td>The baking soda and vinegar didn’t go so well. They both needed to be added at the same time, which was inconvenient. However, it did cause a chemical reaction that thinned out the oil. So, we kept adding it in and the oil was almost completely gone. We put about 75 ml of oil in the pan and about 80 percent was dissolved. This would NOT be a good solution to the problem seeing as how both baking soda and vinegar are chemicals. Therefore, it could harm the environment, meaning it could kill fish, coral, ad overall any sea life that comes in contact with it. This couldn’t be used anywhere mainly because it isn’t healthy for water, or the life within it.</td>
<td>4 minutes</td>
<td></td>
</tr>
</tbody>
</table>
1. Write a summary paragraph on your experiment and the device your team built to tackle the task of cleaning up an oil spill. Explain how you think this device would answer the experiment’s main question.

2. What were the results collected? (Summarize your collected data and observations – give specific examples of the data and explain what the data shows). This is a good place to answer some of the above analysis questions!!

3. How was the hypothesis supported by the data? State the hypothesis and include data to demonstrate how you know that the hypothesis was supported or not supported.

4. Don’t give the procedure again, but do point out possible sources of error that may have occurred in the collection of data and suggest improvements. What were the lessons learned?

Our Oil Spill experiment was actually incredibly successful! We found a way to clean up oil naturally, cleanly, and safely. The way we did that was by using cotton. If the government would choose to take this route, the wildlife would be somewhat of a concern, but not that much. The way the experiment was sufficient, was that we found a way to A.) attract the oil TO a substance, B.) find a way to empty it and C.) the water to oil percentage, was about 95% oil and 5% water. We don’t exactly know what attracts the oil, but we do know that it is a natural material that can help. When the yarn is taken out of the water, the oil clings to it like a sort of film. We then take the string out of the “Oil Spill”, and, using our hands, squeeze the oil out into a separate container. We did this multiple times, and the ending result was almost exactly what we expected the first time. 95% oil, and 5% water.
With the string in the oil for around 2 minutes, we were able to pick out most of the oil, with some water, of course. The process takes about 10 seconds each. You dip the yarn in, stir it around for about 5 seconds, and by then you will see that a sort of trail has been formed around the yarn. It is trying to suck up as much of the substance as it can, and because yarn floats, it takes up mostly the oil on the surface. We tried cotton balls, and one would think that this would work better, but the cotton balls were compacted, and just floated to the bottom to soak up water. The yarn is less dense, so it was able to float well.

Our hypothesis was not supported AT ALL by this experiment. One of our group members forgot to bring the material, so the Acetone part was out. Besides, why would we pour a chemical into the ocean JUST to get another one out? It makes no sense. We have to find a way to do it naturally.

One of the main sources of error was that we did not keep the time consistent. We let the timer go over for the Baking Soda and Vinegar, and the Yarn. This could have been a major error, but luckily we did not suffer from the repercussions, such as something being affected too much for us to carry on, and start over. If we had done the baking soda and vinegar experiment earlier, we would have had to restart, because the fizz disrupted how much oil everything else took up. The lesson learned here is: watch the clock.