Sample Student Responses for Experimentation Questions: "Apple Juice"

Question 1 **Score 3** **Paper A**

This is not a clear statement of the problem. The investigation Group A conducted in no way provides data that could be used to determine "how" enzymes remove apple juice from apple sause. What group A was actually investigating was the amount of apple juice produced from various enzymes and enzyme combinations. A more accurate statement of the problem would have been: Which enzymes most effectively remove juice from apple sause?

This response properly states that it is not a clear statement of the problem. It correctly states that "The investigation conducted in no way provides data that could be used to determine 'how' enzymes remove apple juice from apple sauce." It also describes the problem that Group A was actually investigating. It is clear, complete, and elaborated.

No, because the purpose is not to find out how enzymes remove apple juice from apple sauce. They are testing different dosages of pertinase and cellulase. Therefore they are trying to find out if the enzymes are more efficient in removing the apple sauce, or whether the enzymes are less efficient. Their statement does not clearly represent the experiment that they conducted.

This response properly states that it is not a clear statement of the problem. It correctly states that "the purpose is not to find out how enzymes remove apple juice from apple sauce." It also describes the problem that Group A was investigating.

Question 1 **Score 2** **Paper A**

No, this is not a clear statement of the problem. To make it clear. the group would have to add that they are trying to find the most cost efficient method to produce applejuice from applesauce. Thair problem is also incorrect. In the lab you don't see how enzymes remove the juice, you just see that it is removed.

This response correctly states that the problem is not clear and states that "you don't see how enzymes remove the juice". It explains that "they are trying to find the most cost efficient method" which alludes to the hands-on task that student performed. The response does not address the problem that Group A was actually investigating (comparison of the enzymes) and is, therefore, less complete than the score 3 responses.

Question 1 **Score 2** **Paper B**

No because they were trying to find out how much apple juice comes out the applesauce not how it removes it. They were also trying to determine which enzyme(s) was better to buy.

This response correctly states that the problem is not clear. It also explains that the problem was "not how it removes it." The response does not adequately explain the problem that Group A was actually investigating and, therefore, is less complete than the score 3 responses.

Question 1 **Score 1** **Paper A**

Its a sort of clear statement but they should have worded it like "TO find out what enzymes remove apple juice." or "How does a certain enzyme removes apple juice" similar to the way they wrote it, but in a more scientific way instead of saying "We wanted to find out". According to the problem there doing, their statement doesn't go with the problem. It should be worded to go with the problem.

This response questions the clarity of the statement of the problem, but the explanation is weak. It appropriately states that "they should have worded it like 'to find out what enzymes remove apple juice' " but then goes on to state, "or 'how does a certain enzyme removes apple juice' ". There is some understanding shown although it is not clear if the student understands that Group A was not testing *how* the enzymes worked.

No. The problem was to find out which enzyme produce more apple juice in a cost efficent way.

This response correctly states that the problem is not clear although there is little elaboration. The actual problem that Group A is investigating is addressed in the response ("which enzyme produces more apple juice in a more cost efficient way"). The problem of "how enzymes remove apple juice" is not addressed. It is, therefore, an incomplete response to the question.

Question 1 **Score 0** **Paper A**

No. it isn't because they do not have a controled cup because Maybe if you leave apple sauce by it self it may produced more apple juice than the enzymes

The response does not address Group A's statement of the problem. The discussion of the control is not relevant to the question. It is, therefore, a very limited response to the question.

Question 1 **Score 0** **Paper B**

yes. I think this is A clear statement Because the enzymes that they put in the Apple Sauce made a diffecence because when they put each enzyme with each cup of apple sauce it showed how much apple juice it would make.

This response incorrectly states that it is a clear statement of the problem. There is no understanding shown that there is a problem with the statement “how enzymes remove apple juice”. It is an incorrect response to the question.

Question 2 **Score 3** **Paper A**

Most importantly I believe was that they needed to control how many drops were being used. Also they needed to mix the apple sauce and enzymes for the same amount of time. The time used to filter out the juice needs to be constant the amout of apple sauce. too, needs to be the same in test X.Y. and Z. These need to be controlled so that you are really testing the enzymes effect on the applesauce. If you use 8 drops of pectanase and end up with 20 mL. and use 10 drops of Cellulase and yet 21 mL, is the result because of the enzyme or because of extra enzymes?

This response identifies several important variables that need to be controlled (e.g., “the amount of apple sauce”, “time used to filter”, “mix ... for the same amount of time,” “how many drops were being used”). It also correctly explains why it is important to control these variables. It is a correct and elaborated answer to the question.

Question 2 **Score 3** **Paper B**

First of all, Group A needs to control the amount of apple sauce that they put into each containes. This is important because the amount of apple sauce will determine how much juice is produced. Next, The group needs to control how long they let the apple sauce and the enzymes react. Again, this will determine how much juice is produced.

This response correctly identifies two important variables that need to be controlled ("amount of apple sauce" and "how long they let the apple sauce and the enzyme react."). There is also some elaboration as to why it is important to control these variables.