Examining Experimental Results & Engineering Design Cycles - Video 4

When scientists and engineers finish an experiment, the next important step is to examine the results and draw conclusions. This means looking for trends, checking if the data supports the original hypothesis, and identifying anything unusual. Sometimes, a result doesn't fit the expected pattern. This could be because of factors that weren't considered at first, like someone being tired, a change in temperature, or something about the materials used.

To get reliable results, it's important to test only one variable at a time and keep everything else the same. For example, if you want to know how the amount of water a person drinks before running affects their pulse rate, you should only change the amount of water and keep other factors like time and distance the same.

In engineering, like building a basketball free throw machine, testing and redesigning are key steps. Engineers often build small models first and then make changes to improve performance. They change one thing at a time, like the type of spring or the position of the ball holder, and keep notes about how each change affects the results. This is called the design cycle—it's a process that repeats as you make improvements. Sometimes, a new design doesn't work better, and you need to go back to an earlier version. The process continues until the design meets your goals, but it's never truly finished since there is always room for improvement.

Fill in the Blank: Fill in the blank with the correct words.

1. When analyzing results, you should look for _____ in the data to help you draw conclusions.
2. If one data point does not fit the pattern, it may be affected by an _____ factor.
3. In a controlled experiment, you should only change _____ variable at a time.
4. The process of testing, redesigning, and improving a product is called the _____ cycle.
5. Engineers keep careful _____ to help track changes and results during their experiments.

Multiple Choice Questions: Choose the correct answer from the choices for each question.

1. What is the main reason to only change one variable in an experiment?
   a) To save time
   b) To make the experiment more fun
   c) To see the effect of that variable clearly
   d) To use more materials

2. If you find a data point that doesn't fit your trend, what should you do?
   a) Ignore it
   b) Explain why it might be different
   c) Erase it
   d) Change your hypothesis

3. What is one way engineers improve their designs?
   a) By guessing what might work
   b) By testing and making changes one at a time
   c) By copying someone else's work
   d) By never changing anything

4. What is a hypothesis?
   a) The materials used in an experiment
   b) A guess or prediction that can be tested
   c) The final result
   d) The experiment's title

5. What should you do if your hypothesis is proven wrong?
   a) Change the data to fit it
   b) Ignore the results
   c) Accept it and explain what happened
   d) Never share your results

Open-Ended Questions: Answer the following questions in complete sentences.

1. Why is it important to collect enough data in an experiment?

2. Give an example of an external factor that could affect the results of an experiment.

3. How does the design cycle help engineers create better products?

ANSWER KEY

Fill in the Blank Answers:

1. trends
2. external
3. one
4. design
5. records

Multiple Choice Answers:

1. c) To see the effect of that variable clearly
2. b) Explain why it might be different
3. b) By testing and making changes one at a time
4. b) A guess or prediction that can be tested
5. c) Accept it and explain what happened

Open-Ended Example Responses:

1. It is important to collect enough data to make sure your results are reliable and to help you see clear trends.
2. An example of an external factor is the temperature in the room during the experiment.
3. The design cycle helps engineers by allowing them to test ideas, find problems, make improvements, and keep getting closer to the best design possible.