Using the Scientific Method to Solve Problems

BACKGROUND INFORMATION: Anne was looking for a prefect for the school science fair. She had read an article in a science magazine about feeding antibiotics to chickens. The chickens that were fed antibiotics grew at a faster rate than those that were fed none. Anne thought about the chicken experiment for a long time. After more reading in the library, she decided to design an experiment using red crayfish. Crayfish grow to a maximum size of about 10 cm and mature in 6 - 8 weeks. Female crayfish produce 100 - 400 eggs that hatch in 2 - 3 weeks. Anne's teacher helped her order 144 crayfish from a science supply house. Anne obtained aureomycin, an antibiotic, from her doctor. When the crayfish arrived, Anne divided them in to 6 groups. Each group contained 12 males and 12 females. She placed each group in an identical glass container, fed them the same food, and changed the water in each container every seven days. All six groups were treated the same way except that aureomycin was added to five of the containers after each water change according to the following schedule below.

Group #	milligrams of Aureomycin added after each change of water
1	0
2	25
3	50
4	100
5	200
6	300

Each week, before the water was changed, the sizes of the crayfish were recorded and an average size was obtained for each group. The chart below shows the data collected.

Group #	Average size in centimeters for red crayfish after indicated weeks						
	week 1	week 2	week 3	week 4	week 5	week 6	
1	1.51	3.12	4.05	4.63	6.05	6.94	
2	4.05	6.15	7.23	7.37	7.43	7.45	
3	2.55	5.05	6.55	7.55	7.63	7.7	
4	4.5	6.5	8	9.05	9.55	10	
5	1.55	3.1	4.2	4.55	4.7	4.75	
6	1.55	1.95	2.55	2.85	2.91	2.95	

DIRECTIONS: Using the data from the second data table on the average size of the red crayfish create a multiple line graph using the graph paper provided. Make sure your graph has the following parts:

- Proper Title that includes what is being tested and the variables given.
- Independent variable (the information collected) labeled on the Y Axis with the proper units.
- Dependent variable labeled on the X Axis with the proper units.
- All data points are visible and properly connected.

* if you need help or would like to use the computer to graph, you can use the following web sites:

http://nces.ed.gov/nceskids/graphing/line_data.asp

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DATE: PERIOD:

Student Answer Sheet

DIRECTIONS: After you have created a multiple line graph from the data given, answer the following questions about Anne's experiment using the steps of the scientific method.

A. Recognizing the Problem.

1. Write what Anne's problem statement for the experiment on crayfish would be (remember the first step to the scientific method)?

2. How did she come up with the idea for the project?

B. Gather Information about the Problem.

1. What was the source of information that Anne researched to come up with her Problem statement?

2. What other information will Anne have to research before she can start her project (imagine that you are Anne when answering this question)?

A. State a Hypothesis.

1. What do you think Anne's hypothesis was?

2. Upon what basis did Anne form this hypothesis?

B. Perform an Experiment to Test your Hypothesis.

1. Does Anne's experiment have a control group? Explain why this particular group so important and what this group consist of)?

2. Why was it important for Anne to use many crayfish during her experiment?

3. What was the experimental or variable factor in Anne's experiment?

C. Recording and Analyzing Data.

1. What did Anne use to record her information? What did Anne use to draw a picture of her information so that she could analyze the results?

2. When previewing her graphed results, what detailed analysis can be determined about crayfish?

3. Which group showed the least increase in size for the six week period?

4. Which group showed the greatest increase in size during any 2 week interval? During which two week interval (be careful to analyze all the results, remember slope)?

D. Conclusion.

1. After completing her experiment and analyzing all the results what conclusions (complete detailed summary) did Anne draw?

2. Of what practical value (helpful to society and related to what she did) could an experiment like this be?

E. Replicating the Work.

1. What should Anne do now that she is finally finished with her project?