The Scientific Process Critiqued

Read and discuss each scientific experiment. Analyze each experiment's strengths and weaknesses with your partner by answering the questions that follow.

Experiment 1:

Five tomato plants of the same height were placed in the same size pots, in the same type of soil and each was given the same amount of water. Each plant was under a light bulb of the same intensity as the others but each light was of a different color. Each day, the plants were given light (each its own color) for 12 hours and left in darkness for 12 hours. The height of each plant was measured in centimeters at the end of each week for 10 weeks.

Week # →	1	2	3	4	5	6	7	8	9	10
Light color ↓										
Yellow	4	5	6	7	8	9	10	11	12	13
Green	4	4	4	3	3	2	2	1	0	0
Blue	4	4	4	5	5	5	5	6	6	6
Purple	4	4	5	5	6	6	7	7	8	8
Red	4	5	6	7	8	9	10	11	12	13

a. What question is tested by this experiment?

b. Write two hypotheses and one null hypothesis for this experiment.

H_1:

H_2:

H_0:

c. What is the variable?

d. What factors are held constant in the experiment?

e. Is there a control?

- If there is, what type of control is it (positive, negative or baseline)
- If not, what control would you suggest?

f. Write two conclusions for this experiment.

1)

2)

g. Describe the strengths of this experiment.

h. Describe the weaknesses of this experiment.

Experiment 2:

Five soup cans were painted black and five cans were painted white. A quarter liter of 24°C water was added to each can each morning at 8 a.m. and the temperature of the water in each can was recorded in degrees Celsius at noon each day for seven days.

	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
Black #1	45	37	40	41	32	35	40
Black #2	45	37	40	41	32	35	40
Black #3	45	37	40	41	32	35	40
Black #4	45	37	40	41	32	35	40
Black #5	45	37	40	41	32	35	40
White #1	41	33	36	37	28	31	36
White #2	41	33	36	37	28	31	36
White #3	41	33	36	37	28	31	36
White #4	41	33	36	37	28	31	36
White #5	41	33	36	37	28	31	36

a. What question is tested by this experiment?

b. Write two hypotheses and one null hypothesis for this experiment. H_1:

H_2:

H_0:

c. What is the variable?

d. What factors are held constant in the experiment?

e. Write two conclusions for this experiment.

1)

2)

f. Describe the strengths of this experiment.

g. Describe the weaknesses of this experiment.

Experiment 3:

A scientist wanted to determine if classical music helped people relax more than rap music. She asked 1,000 20-year-old men and 1,000 20-year-old women to participate in her experiment at the same time each day, in the same location and under the same conditions. She had each person rest on a bed while she played a classical music recording for 30 seconds and then she asked them to describe how they felt. She would then repeat this procedure, playing rap music instead of classical music. She alternated the type of music played first, but she always used the same sample of classical music and the same sample of rap music.

a. What question is tested by this experiment?

b. Write two hypotheses and one null hypothesis for this experiment. H_1:

H_2:

H_0:

c. What is the variable?

d. What factors are held constant in the experiment?

e. Describe the strengths of this experiment.

f. Describe the weaknesses of this experiment.

Experiment 4:

A scientist wanted to determine which language is the hardest to learn. He created an experiment using 6,000 African Gray parrots as test subjects. The parrots were left alone in a room with a tape playing all day and all night. On the tape was the word “hello” repeated 100 times in a row for each of 20 languages. Each day the scientist went into the room and checked to see if any of the parrots had learned any of the languages.

a. What question is tested by this experiment?

b. Write two hypotheses and one null hypothesis for this experiment. H_1:

H_2:

H_0:

c. What is the variable?

d. What factors are held constant in the experiment?

e. Describe the strengths of this experiment.

f. Describe the weaknesses of this experiment.