Engaging Students in Contextual Writing for AP Statistics Exams

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Presentation Link: https://rb.gy/bo45gl

PRESENTATION DESCRIPTION: Let's explore and discuss a Test Prep Reflection and Class Assessment Activity that students have given positive feedback for years on preparing them to write free responses solutions. These activities are appropriate for other AP courses with free response questions as well, when prepping for AP exams! In preparation for the webinar, take a look and work for yourself before the webinar begins, question 1 from 2005 which can be found on AP Central.

Using AP Statistics Exam questions, participants will engage in two activities that have the following student outcomes:

- students will gain an understanding of writing expectations without using viewing a rubric
- students will gain an understanding of the scoring of free response questions
- students will work collaboratively to construct a response to a free response question
- students will analyze classmates responses to free response questions

Link to AP Central AP Statistics Exam Page: https://rb.gy/r4wmsl

AP Statistics Past Exam Questions: https://rb.gy/gkidlp

STATISTICS
SECTION II
Part A
Questions 1-5

Spend about 65 minutes on this part of the exam.

Percent of Section II grade—75

Directions: Show all your work. Indicate clearly the methods you use, because you will be graded on the correctness of your methods as well as on the accuracy of your results and explanation.

1. The goal of a nutritional study was to compare the caloric intake of adolescents living in rural areas of the United States with the caloric intake of adolescents living in urban areas of the United States. A random sample of ninth-grade students from one high school in a rural area was selected. Another random sample of ninth graders from one high school in an urban area was also selected. Each student in each sample kept records of all the food he or she consumed in one day.

   The back-to-back stemplot below displays the number of calories of food consumed per kilogram of body weight for each student on that day.

Urban		Rural
9 9 9 9 8 8 7 6	2	
4 4 3 1 0	3	2 3 3 4
9 7 6 6 5	3	5 6 6 6 7
2 0	4	0 2 2 2 4
	4	5 6 8 8 9
	5	1

Stem: tens
Leaf: ones

(a) Write a few sentences comparing the distribution of the daily caloric intake of ninth-grade students in the rural high school with the distribution of the daily caloric intake of ninth-grade students in the urban high school.

(b) Is it reasonable to generalize the findings of this study to all rural and urban ninth-grade students in the United States? Explain.

(c) Researchers who want to conduct a similar study are debating which of the following two plans to use.

Plan I: Have each student in the study record all the food he or she consumed in one day. Then researchers would compute the number of calories of food consumed per kilogram of body weight for each student for that day.

Plan II: Have each student in the study record all the food he or she consumed over the same 7-day period. Then researchers would compute the average daily number of calories of food consumed per kilogram of body weight for each student during that 7-day period.

Assuming that the students keep accurate records, which plan, I or II, would better meet the goal of the study? Justify your answer.

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Test Prep Reflection

Name_____
Chapter_____
Date_____ Period_____

1. "Score" each of the student samples. Record below.

   Sample A _____ Sample B _____ Sample C _____

2. Discuss these scores with your group. Did you agree? Why or why not?

3. What made the best response different from the worst response? Be specific in your response.

4. How would you rate your response after looking at the student samples? Be specific in your comparisons.

5. If you were asked to develop a scoring rubric for this problem, what would the perfect response have to contain? What components would be necessary to receive a 4 on this problem?

1A

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SECTION II
Part A
Questions 1-5

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Urban		Rural
99998876	2	
44310	3	2334
97665	3	56667
20	4	02224
	4	56889
	5	1

Stem: tens
Leaf: ones

(a) Write a few sentences comparing the distribution of the daily caloric intake of ninth-grade students in the rural high school with the distribution of the daily caloric intake of ninth-grade students in the urban high school.

The distribution of the daily caloric intake of ninth-grade students in the rural high school is approximately symmetric while the distribution of the daily caloric intake of ninth-grade students in the urban high school is skewed right. Neither distributions have an outlier. The median (32) of the urban distribution and its Q_1 (21) and Q_3 (36) are all less than that of the rural distribution. The rural distribution has a spread of 19 larger than the urban distribution spread of 16. The IQR of the urban distribution is 5 which is less than the IQR of the Rural distribution which is 10. which has a median of 41 Q_1 equal to 35.5 and Q_3 equal to 45.

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(b) Is it reasonable to generalize the findings of this study to all rural and urban ninth-grade students in the United States? Explain.

No, there are many different rural and urban areas in the united states, this sample only encompases students from two schools. There are many more students who don't go to highschool, or many schools may even administer healthier lunches. There are just too many confounding or lurking variables to generalize the findings of this study to ALL rural and urban ninth-grade students in the United states.

(c) Researchers who want to conduct a similar study are debating which of the following two plans to use.

Plan I: Have each student in the study record all the food he or she consumed in one day. Then researchers would compute the number of calories of food consumed per kilogram of body weight for each student for that day.

Plan II: Have each student in the study record all the food he or she consumed over the same 7-day period. Then researchers would compute the average daily number of calories of food consumed per kilogram of body weight for each student during that 7-day period.

Assuming that the students keep accurate records, which plan, I or II, would better meet the goal of the study? Justify your answer.

Plan II would be better because it encompasses a 7-day period which would average out any days that a student might have eaten an extremel, large amount or a very small amount. In plan I the amount of food is only during one day, and in that one day there might be variables which would cause that person to eat more or less then they normally would.

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1B

STATISTICS
SECTION II
Part A
Questions 1-5

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99998876	2	
44310	3	2334
97665	3	56667
20	4	02224
	4	56889
	5	1

median 34
n= 20 mean 32.6

median 41
mean : 40.45
n=20

Stem: tens
Leaf: ones

30 pts

(a) Write a few sentences comparing the distribution of the daily caloric intake of ninth-grade students in the rural high school with the distribution of the daily caloric intake of ninth-grade students in the urban high school.

the Urban sample distribution has a center of approximately 33 and is skewed towards lower caloric intakes a spread of 26 to 42 with no outliers
the rural sample distribution is roughly symmetrical arround a center of 41 cal per kg of body weight a spread of 32 to 51 with no outliers

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1B

(b) Is it reasonable to generalize the findings of this study to all rural and urban ninth-grade students in the United States? Explain.

It is not reasonable to generalize these findings to all rural and urban 9th grade students because the sample size is so small, and only includes two schools

these two schools could have very different meal plans provided during the school day than the average plans of highschools in the nation

Only using two schools leaves room for confounding variables

(c) Researchers who want to conduct a similar study are debating which of the following two plans to use.

Plan I: Have each student in the study record all the food he or she consumed in one day. Then researchers would compute the number of calories of food consumed per kilogram of body weight for each student for that day.

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Assuming that the students keep accurate records, which plan, I or II, would better meet the goal of the study? Justify your answer.

plan II, it would give a more realistic view of the students daily calorie intake by averaging over a seven day period. this would help reduce the impact of unusually high or low days (such as a party or a day in which a meal was missed) these averages would more realistically represent each student

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1 C

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4 4 3 0 0	3	2 3 3 4
9 7 6 6 5	3	5 6 6 6 7
2 0	4	0 2 2 2 4
	4	5 6 8 8 9
	5	1

42

Stem: tens
Leaf: ones

(a) Write a few sentences comparing the distribution of the daily caloric intake of ninth-grade students in the rural high school with the distribution of the daily caloric intake of ninth-grade students in the urban high school.

Students in rural high school has higher median and range Compared to Students in urban high school. Almost half of the data for urban School is in 20's, but the data of rural is well distributed. Shape of the distribution for urban is skewed to the right, and shape of the distribution for rural is nearly symmetric. There is no gap in either school.

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1C

(b) Is it reasonable to generalize the findings of this study to all rural and urban ninth-grade students in the United States? Explain.

It is not reasonable to generalize the findings of this study because the sample size is small, and there could be some confounding variables that controls the calories of students in each area.

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1A

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1A

(b) Is it reasonable to generalize the findings of this study to all rural and urban ninth-grade students in the United States? Explain.

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1B

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Part A
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20	4	02224
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	5	1

median 41
mean : 40.45
n=20

median 34
n=20 mean 32.6

Stem: tens
Leaf: ones

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1B

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these two schools could have very different meal plans provided during the school day than the average plans of highschools in the nation
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1C

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44310	3	2334
97665	3	56667
20	4	02224
	4	56889
	5	1

Stem: tens
Leaf: ones

(a) Write a few sentences comparing the distribution of the daily caloric intake of ninth-grade students in the rural high school with the distribution of the daily caloric intake of ninth-grade students in the urban high school.

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1C

(b) Is it reasonable to generalize the findings of this study to all rural and urban ninth-grade students in the United States? Explain.

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Question 1

Overview

This question described a study comparing the caloric intake for a random sample of 20 students from one rural high school to a random sample of 20 students from one urban high school. The variable measured was the number of calories of food per kilogram of body weight consumed in one day by a student. A back-to-back stemplot displayed the number of calories consumed for each student on that day. Part (a) of the question asked students to use the stemplot to compare the data distributions from both schools. The response should have included a clear, correct comparison statement for each of the three characteristics: shape, center (position), and spread. It was not sufficient simply to list and describe those characteristics separately for each distribution. Part (b) asked whether it was reasonable to generalize the findings of the study to all rural and urban ninth-grade students in the United States. The response should have clearly indicated that generalizing was not appropriate, since only one urban school and one rural school were used. The sampling unit was the school, not the students chosen for the study or the area from which those students were selected. Part (c) presented two plans for consideration in conducting a similar study. Plan I used only one day; Plan II used the same 7-day period with a 7-day average computed for the number of calories consumed by each student. Plan II better met the goal of the study because it accounted for the effect of day-to-day variability. A correct justification should have indicated an understanding of what might cause systematic day-to-day variability in the difference between rural and urban students in the number of calories consumed on different days of the week (different amounts of calories consumed on a weekday versus weekend day), not just the advantage of a 7-day average.

Sample: 1A
Score: 4

Each part of this response is complete and clearly communicated. In part (a) the correct distribution shapes are stated. Measures of position (median, Q1, and Q3) for urban are compared ("all less than") to those for the rural. The spread of rural (using range) is compared to that for urban. There is a minor error (the IQR for urban is 7 rather than 5, and Q1 for rural is incorrect); however, specific values are not required, and the student was not penalized. In part (b) it is clear why generalization is not possible since students in the sample were from only two schools. The last sentence is not needed. In part (c) the first sentence states the advantage of "a 7-day period which would average out any days that a student might have eaten an extremely large amount or a very small amount"—conveying an understanding of the day-to-day variability. The last sentence further supports the justification of what might cause day-to-day variability. Students tend to personalize the day-to-day variability by talking about an individual student. This is not ideal but judged to include enough of the idea of day-to-day variability.

Sample: 1B
Score: 2

This is an example of a developing response. In part (a) the rural distribution is described as roughly symmetrical, and the urban distribution is described as skewed toward lower values. Although the skew is actually toward higher values, this is considered a minor error since visually turning the paper to make the urban stemplot horizontal appears to make the graph skewed left. Although values for center and spread are given for each distribution, the values are described separately for each distribution and no comparison is made. Only one out of three characteristics is correctly compared. In part (b) the first paragraph mentions the sample size is too small and only includes two schools. It is not clear if the small sample size refers to students or to schools. However, the following

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Question 1 (continued)

two sentences clarify that the two schools have been correctly recognized as the sampling unit with too small of a sample size. In part (c) Plan II is selected, and the justification of day-to-day variability is indicated by discussing "the impact of unusually high or low days (such as a party or a day in which a meal was missed)."

Sample: 1C
Score: 1

This response provides a minimal, but complete, answer in part (a). The first sentence states: "Students in rural high school has [*sic*] higher median and range compared to students in urban high school." This sentence nicely emphasizes immediately the comparison of center and spread. The comparison of shape is given in the last sentence. Part (a) is a simple, straightforward presentation. In part (b) the first sentence states that "the sample size is small." There is no reference to whether the sampling unit is the number of schools or the number of students. The comment on confounding variables is considered extraneous. Thus, the student does not adequately answer this question. In part (c) Plan II is selected with the statement that "a week period of food he or she consume [*sic*], the data would be more reliable" giving a hint of the day-to-day variability. This is a weak justification for saying more days are better than one day.

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