Explore two example CRC Reports:

BIOLOGY, THE "WEIGHT LOSS" QUESTION PAGES 1-3

STATISTICS, THE "STUDENT SLEEP" QUESTION PAGES 4-6

The "Weight Loss" Question (Sripathi et al., 2019)

QUESTION TEXT:

You have a friend that lost 15 lbs on a diet. Where did the mass go?

BACKGROUND:

This is an open response version of a diagnostic question cluster question (Wilson et al., 2006). It assesses whether students can keep track of matter, while traversing biological scales.

FURTHER READING:

Sripathi, K. N., Moscarella, R. A., Yoho, R., You, H. S., Urban-Lurain, M., Merrill, J., & Haudek, K. (2019). Mixed Student Ideas about Mechanisms of Human Weight Loss. CBE—Life Sciences Education, 18(3), ar37. https://doi.org/10.1187/cbe.18-11-0227

Wilson, C. D., Anderson, C. W., Heidemann, M., Merrill, J. E., Merritt, B. W., Richmond, G., Sibley, D. F., & Parker, J. M. (2006). Assessing Students' Ability to Trace Matter in Dynamic Systems in Cell Biology. CBE—Life Sciences Education, 5(4), 323–331. https://doi.org/10.1187/cbe.06-02-0142

AACR Feedback Report for "Weight Loss" Question

STUDENT RESPONSE SCORING
ANALYTIC RUBRIC CATEGORY DISTRIBUTION AND DESCRIPTION

For this question, your students fall into 8 rubric bins. Students with similar ideas fall into the same rubric bin. The 8 rubric bins and the number of student responses in each rubric bin are shown in the figure below. The rubric bins are not mutually exclusive, so any individual response may appear in multiple bins.
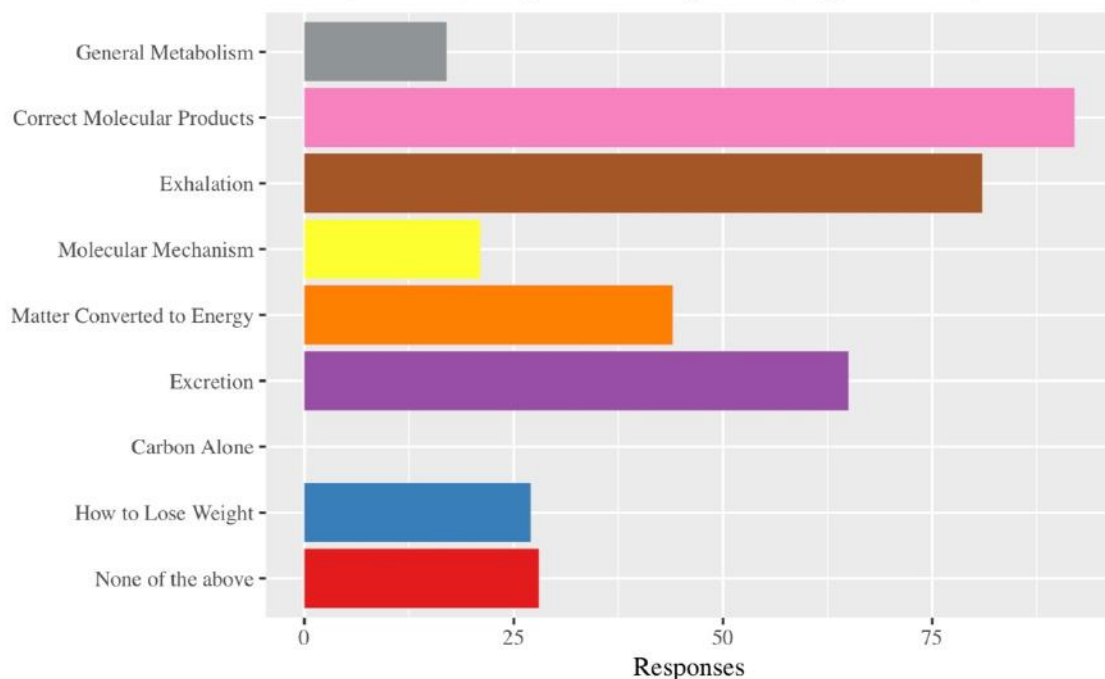

ANALYTIC RUBRIC CATEGORY DISTRIBUTION AND DESCRIPTION

Rubric Bin	Description
General Metabolism	Students describe mass conversion in a vague or incorrect way (e.g., fat being converted to sugar). This category is mutually exclusive with the 'Molecular Mechanism' category.
Correct Molecular Products	Students mention carbon dioxide, using any nomenclature (e.g., CO2 is also accepted). This category is mutually exclusive with the 'Carbon Alone' category.
Exhalation	Students describe exhaling out the mass, or the mass rejoining the air, atmosphere, etc.
Molecular Mechanism	Students name or describe in detail the correct molecular processes of fat breakdown. This category is mutually exclusive with the 'General Metabolism' category.
Matter Converted to Energy	Students talk about an input of mass being converted to an output of energy in a vague or incorrect way.
Excretion	Students discuss the weight being lost through physiological excretion.
Carbon Alone	Students discuss carbon, but not specifically in a compound such as carbon dioxide. This category is mutually exclusive with the 'Correct Molecular Products' category.
How to Lose Weight	Students discuss informal or societal explanations of weight loss (e.g., exercise, calories in greater than calories out, etc.).

# Association Web Diagram for "Weight Loss" Question

The circular nodes in this plot correspond with the item rubric bins. The edges (lines) connecting the nodes correspond to co-occurrence rates between the rubric bins in the scored sample. In this diagram both nodes and edges are scaled in size and color to represent the range of rubric bin and co-occurrence frequencies.
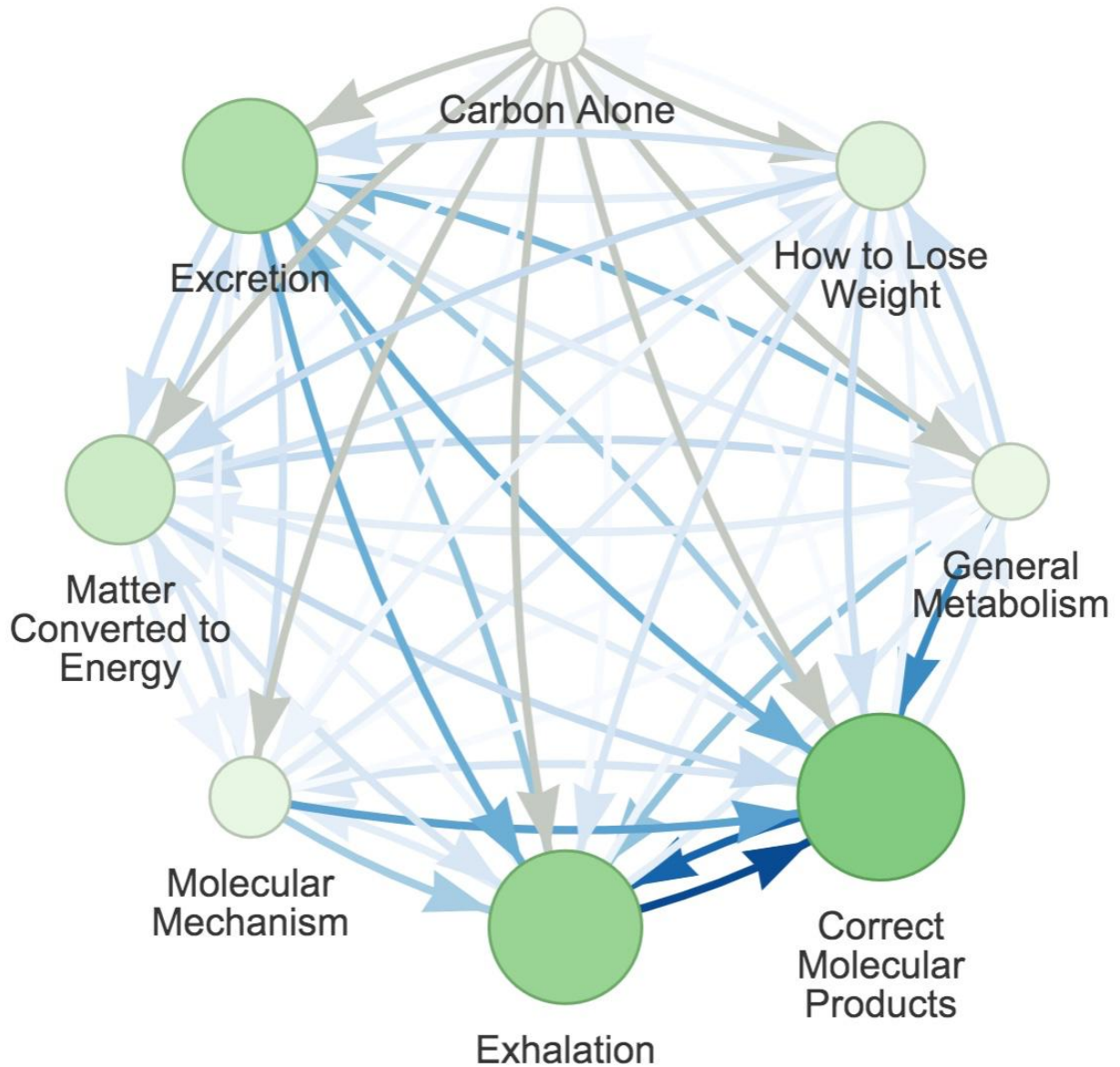
The "Student Sleep" Question (Kaplan et al., 2014)

The histogram below shows the distribution of the number of hours a random sample of 471 high school students in Georgia slept on the previous school night. Describe as completely as possible the distribution shown in the histogram, being sure to explain what the graph tells you about the number of hours high school students in Georgia sleep on school nights.
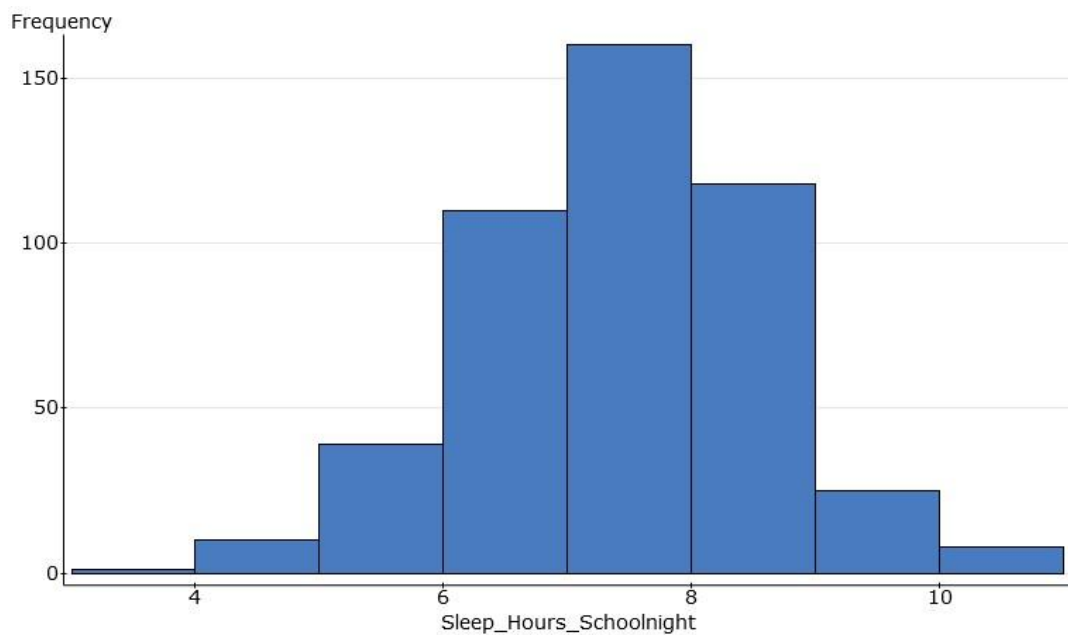
BACKGROUND:

This question assesses whether students include four important statistical properties in their description of a provided histogram.
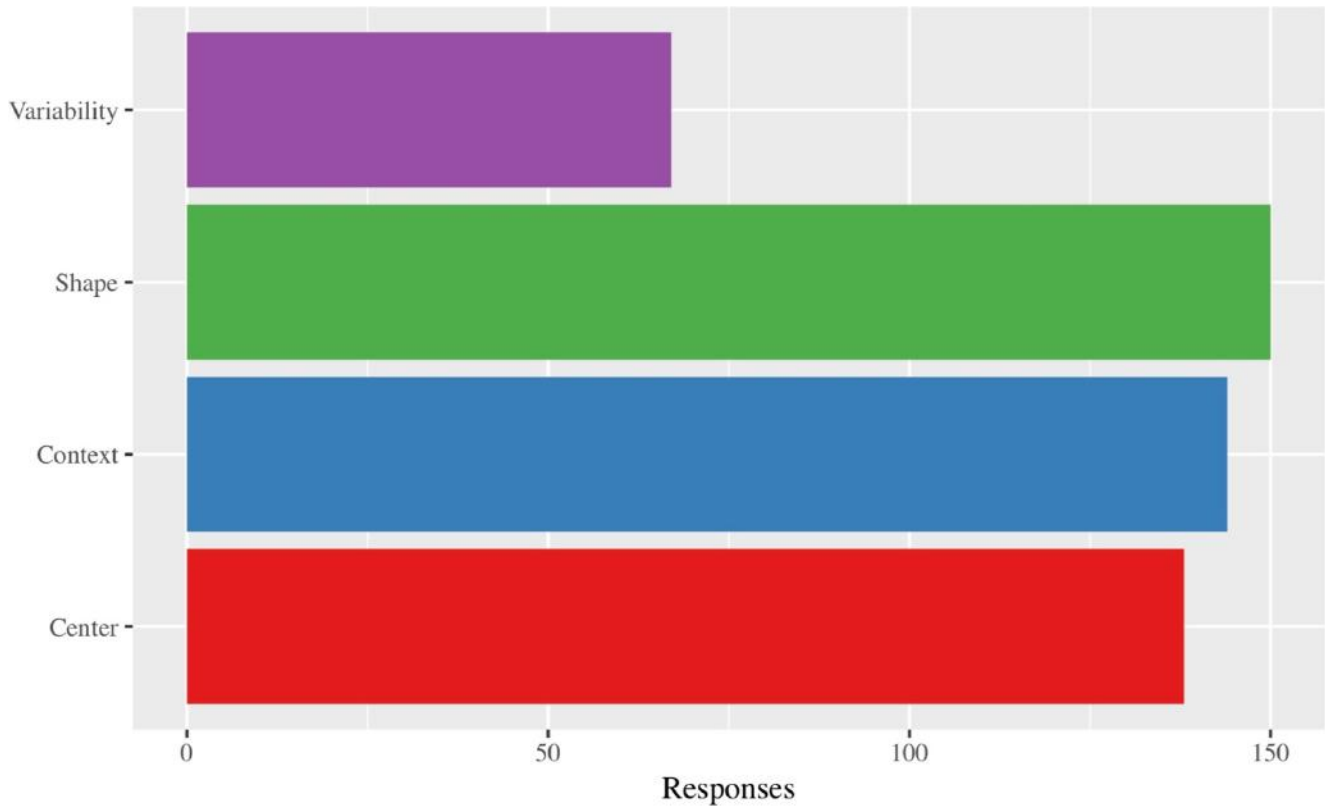
FURTHER READING:

Kaplan, J. J., Gabrosek, J., Curtiss, P., Malone, C. J. (2014, August 2-7) Everyone Knows What a Histogram Is, or Do They?: How Non-Statisticians Read Histograms. [Paper Presentation] Joint Statistical Meetings, Boston, MA.

AACR Feedback Report for "Weight Loss" Question

ANALYTIC RUBRIC CATEGORY DISTRIBUTION AND DESCRIPTION

For this question, your students fall into 4 rubric bins. Students with similar ideas fall into the same rubric bin. The 4 rubric bins and the number of student responses in each rubric bin are shown in the figure below. The rubric bins are not mutually exclusive, so any individual response may appear in multiple bins.

ANALYTIC RUBRIC CATEGORY DISTRIBUTION AND DESCRIPTION

Rubric Bin	Description
Shape	Students must correctly discuss the shape of the histogram by describing Student Sleep as symmetric, unimodal, bell-shaped, or approximately normal
Center	Students must give a valid measure of center (e.g., mean, median, mode, average) and correctly state its location.
Variability	Students must discuss either the range of the data, highlight potential outliers, locate the maximum and minimum values, or give an approximation of the variability directly.
Context	Students must answer the question within the context of the problem by using the appropriate variable with the appropriate units (e.g., 8 hours) and identifying the subject of each unit (e.g., students). At least two of the three following aspects: variable, units, and population, must be present

Association Web Diagram for "Student Sleep" Question

The circular nodes in this plot correspond with the item rubric bins. The edges (lines) connecting the nodes correspond to co-occurrence rates between the rubric bins in the scored sample. In this diagram both nodes and edges are scaled in size and color to represent the range of rubric bin and co-occurrence frequencies.