

2. Mr. Gomez decides to conduct a study with his sixth-grade math class, after first obtaining informed consent. Half of his students happen to arrive early for class (group 1), so he uses the time to give them some extra problem-solving tips. The next week he compares their scores on a quiz with the scores of the students who arrived on time (group 2) and did not receive the tips. The students' grades are represented in the table below. Mr. Gomez comes to the conclusion that the problem-solving tips led to higher scores on the quiz. Mr. Gomez posts the table of grades on the door of his classroom to emphasize that the tips helped improve the student grades.

Group 1	Grade on Quiz	Group 2	Grade on Quiz
Jaime	4	Lynda	3
Steven	5	Adam	4
Thomas	3	Sami	1
Elizabeth	3	Marlena	1
Marwa	7	Kiara	5
Frances	6	Caylin	4
Fekru	3	Darin	2
David	6	Chinami	4

- Identify the dependent variable presented in the study.
- Explain how the study could be modified to be an experiment.
- Compare the mode of group 1 to the mode of group 2.
- Identify the measure of central tendency that needs to be calculated to determine the standard deviation.
- Explain the ethical flaw that is explicitly presented in the study.
- Explain how metacognition could apply to the scenario.
- Suppose Mr. Gomez had conducted this study as an experiment without any flaws and obtained the same results and that the results were statistically significant. Explain how the findings depicted in the table above could support the theory of levels of processing.

**Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.**

**Question 2: Research Methodology****7 points****General Considerations**

1. Answers must be cogent enough for the student’s meaning to come through. Spelling and grammatical mistakes do not reduce a student’s score, but spelling must be close enough so that the reader is convinced of the word.
2. A student can earn points only if the student clearly conveys what part of the question is being answered. It is possible to infer the part of the question being answered if it is consistent with the order of the question.
3. The response must apply the concept to the prompt; a definition alone will not earn the point.
4. Examples provided in the Scoring Guidelines for each of the points are not to be considered exhaustive.
5. Within a bulleted question part, a student will not be penalized for misinformation unless it *directly contradicts* correct information that would otherwise have earned a point. For example, if a response applies a concept in two contradictory ways (such as identifying both the measured variables as the independent variable or describing proactive interference as interference from both older and newer information), the point is not earned.
6. Within a bulleted question part, if the response addresses details from a scenario other than the one in the prompt, the point is not earned.

**Part A** Mr. Gomez decides to conduct a study with his sixth-grade math class, after first obtaining informed consent. Half of his students happen to arrive early for class (group 1), so he uses the time to give them some extra problem-solving tips. The next week he compares their scores on a quiz with the scores of the students who arrived on time (group 2) and did not receive the tips. The students’ grades are represented in the table below. Mr. Gomez comes to the conclusion that the problem-solving tips led to higher scores on the quiz. Mr. Gomez posts the table of grades on the door of his classroom to emphasize that the tips helped improve the students’ grades.

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**Identify the dependent variable presented in the study.**

**1 point**

The response must indicate score on the quiz as the dependent variable.

**Acceptable explanations include:**

- *The dependent variable is the score the students earn on the quiz.*

**Unacceptable explanations include:**

- *The dependent variable is the one that is measured.*
  - *The dependent variable is the problem-solving tips.*
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**Explain how the study could be modified to be an experiment.**

**1 point**

The response must indicate that the study could be modified by adding random assignment to make it an experiment.

**Acceptable explanations include:**

- *The study needs to have random assignment in each experimental condition in order for it to be an experiment.*
- *Mr. Gomez would need to put people in groups randomly in order to make this an experiment.*

**Unacceptable explanations include:**

Responses that refer to the manipulation of a variable without discussion of random assignment.

Responses that refer to flaws in research design, such as sampling bias, or other confounding variables.

- *Mr. Gomez manipulated his variable, which makes it an experiment.*
  - *Mr. Gomez might avoid bias by randomly selecting people for his study.*
  - *Mr. Gomez would have to make sure that both groups received instructions for the quiz at the same time.*
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**Compare the mode of Group 1 to the mode of Group 2.**

**1 point**

The response must indicate either that the mode of Group 1 is lower than the mode of Group 2 (or vice versa).

**OR**

The response must indicate that the mode of Group 1 is 3, and the mode of Group 2 is 4.

**Acceptable explanations include:**

- *The mode of group 1 is lower than group 2.*
- *Group 1's mode is 3 and Group 2's mode is 4, so they are different.*

**Unacceptable explanations include:**

- *The groups modes are irrelevant.*
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- Part B** Suppose Mr. Gomez had conducted this study as an experiment without any flaws and obtained the same results and that the results were statistically significant.

**Explain how the findings depicted in the table above could support the theory of levels of processing.** 1 point

The response must indicate either that Mr. Gomez used problem-solving tips that promoted deep processing and increased scores.

OR

The response must indicate that the group that did not receive the tips used shallow processing and scored worse.

**Acceptable explanations include:**

- *Students who used the problem-solving strategies used deep processing and that helped them learn more in class.*
- *Mr. Gomez's strategies worked well because they helped students process things more deeply.*
- *Students who did not use the problem-solving strategies used shallow processing and learned less in class.*

**Unacceptable explanations include:**

- *Students who process things on multiple levels can learn better.*
- *Students who use their long-term memory do better than students who use their short-term memory.*

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**Total for question 2** 7 points