**Name KEY**

**SAS 3A. 1 – Overview of Purpose, Design, and Statistical Studies – Day 3**

1. The following cases are examples of observational studies and experimental studies. Consider the type and design of each study. Identify the type of study for each case (experimental or observational). For each case explain how you know the type of study, what the variable of interest is, and list advantages and disadvantages of each plan.
   1. Mrs. Johnson teachers American History and wanted to help her students do their best on exams. After failing to find any research on different test formats, she decided to conduct her own research. She flipped a coin for each students in her classes. If the coin landed heads up, the student took a multiple-choice test. If the coin landed tails up, the student received a fill-in-the-blank exam. Afterward, Mrs. Johnson compared the averages for the two test formats.
   2. In World History, Mr. McDonald has a similar concern. He decided, however, to ask his students. He put a question at the bottom of an exam: “Which do you prefer, multiple – choice or fill-in-the-blank questions?” Afterward, Mr. McDonald tailed the results.
   3. Mr. Mitchell was interested in the effects of music on student performance. At the bottom of his exam, he asked students to circle their favorite type of music: rock, country, or hip hop. He then computed the averages for the students who liked each type of music and compared the results.
   4. Mrs. Knox’s senior English classes were working on their term themes. During 2nd period, she allowed students to listen to their choice of music through earphones while working, but her 4th period class was required to work quietly without music. Mrs. Knox averaged this major grade for each class and compared 2nd period’s average to 4th period’s average.
   5. Mr. Paul, the guitar teacher, sat at the food court in the mall and made a tally sheet that noted each t-shirt he saw with a musical group illustrated on it. He complied the results and posted an entry to his blog about the most popular groups.

**a. Mrs. Johnson**

Experimental Study

Mrs. Johnson applied two different treatments.

The variable of interest was student scores. (The following portion of the answer may vary.)

Advantage: This plan compares actual average results, not student preferences.

Disadvantage: Because the scores are averaged, students who had low performance on the format with the higher average may be overlooked.

**b. Mr. McDonald**

Observational Study

Mr. McDonald asked a question of students, so it is like a survey or interview.

(The following portion of the answer may vary.)

The variable of interest was the test format.

Advantage: He asked what they liked better.

Disadvantage: The format students prefer might not actually be the format in which they perform better.

**c. Mr. Mitchell**

Observational Study

Mr. Mitchell also asked a question of students, and the variable of interest was the students’ averages. (The following portion of the answer may vary.)

Advantage: He can determine if students who like a certain style of music have higher performance.

Disadvantage: This approach does not demonstrate that the music makes a difference in the scores.

**d. Mrs. Knox**

Experimental Study

Mrs. Knox also applied two different treatments. The variable of interest was the student scores. (The following portion of the answer may vary).

Advantage: The choice of treatment is very clear—either students listened to music or not.

Disadvantage: Since students were listening to all types of music, the analysis of results may be difficult. In fact, some students in 2nd period may not have a portable player, but their scores are compiled with the students who did.

**e. Mr. Paul**

Observational Study

Mr. Paul literally observed the t-shirts of the people at the mall. Since his only interest was popular groups, the group on the shirt was the variable of interest.

(The following portion of the answer may vary.)

Advantage: This approach is convenient.

Disadvantage: This approach may not reveal the most popular groups, though, because some groups may have fans who do not go to malls.

2. In the experimental studies, (a) describe the treatment(s), (b) who the participants were, (c) how the assignment of treatment(s) was accomplished.

The treatment in Mrs. Johnson’s case is the type of question format the student is given.

The participants are all students in her American History classes. She flipped a coin to assign treatments (that is, determine which question format each student received).

Mrs. Knox’s treatments were music or no-music. The participants are her students. We are not told how she determined which class got which treatment.

Researchers are often concerned that participants in a study show improvement simply because they are in the study and not because they are receiving an effective treatment. This is called the **placebo effect**.

Example 1: Half of the participants in a study for a new headache remedy receive the new pill, while the remaining participants receive a pill containing only inactive ingredients. Participants receiving the inactive pill (the placebo) report that their headaches have been somewhat relieved. These participants believed they were being treated, and this belief may have affected their perception.

Example 2: Half of the athletes in a study received a new lotion for strained muscles, while the other half received a lotion with only inactive ingredients. Both groups report improvement in their muscle pain.

3. The improvement in Example 2 could be psychological, as in Example 1. Can you think of any other reason for the improvement?

The massaging associated with applying the lotion could have beneficial effects. If both groups show equal improvement, all improvement could be a placebo effect. If the treatment group improves substantially more than the control group, the new lotion could be an effective treatment.

4. Describe in your own words what the placebo effect is.

The placebo effect is where someone is assigned a “sugar pill” or a fake treatment and they appear to show improvement/have some results similar to that of the real medicine/treatment because the participant only thinks that he or she is receiving the actual treatment – psychological.

**Extensions:**

5. Consider Mrs. Johnson and Mr. McDonald’s exam situations. Suppose Mrs. Johnson’s results overwhelmingly favor fill-in-the-blank exams and Mr. McDonald’s results strongly favor the multiple-choice format. Are these results in conflict with each other? What could be the cause(s) of this difference?

Answers may vary. Students may like the multiple-choice format better without realizing that they would do better on a fill-in-the-blank test. Mr. McDonald is recording preferences, while Mrs. Johnson is measuring performance. In addition, Mrs. Johnson and Mr. McDonald may teach differently from each other, their tests may be very different, and the types of students in their classes may vary.

6. Mrs. Johnson applied two different treatments to the participants in her study. Some students received a multiple-choice test, and the rest received a fill-in-the-blank exam. Can you think of two treatments that could be used in a medical experiment? In a cooking experiment? Would a situation with three or more treatments be possible? Explain your thinking.

Answers may vary. In a medical experiment—giving a different medication to each of two groups of participants; in a cooking experiment—making a dish twice, each time changing one spice. Yes, you could have three or more treatments, comparing three medications, three spices, or even three different amounts of the same medication or spice.