Practice Assignment: Advanced Experimental Design

1) Consider the completely randomized block design.

   Part A: What are the basic principles of the completely randomized block design?

   a) Blocking and randomization

   b) Observation of the individuals in the study without trying to influence the outcome of the study and randomization

   c) Blocking and observation of the individuals in the study without trying to influence the outcome of the study

   d) Observation of the individuals in the study without trying to influence the outcome of the study

   Part B: What role does blocking play in the completely randomized block design?

   a) It eliminates all possible effects of the nuisance factor.

   b) It allows the researcher to create comparable groups.

   c) It controls for a known difference that affects the response variable.

   d) It collects information from the subjects before and after the administration of a treatment.

   Part C: What role does randomization play in the completely randomized block design?

   a) It eliminates all possible effects of the nuisance factor.

   b) It allows the researcher to create comparable groups.

   c) It controls for a known difference that affects the response variable.

   d) It collects information from the subjects before and after the administration of a treatment.

2) Consider an experiment being designed to study the effectiveness of an experimental pain reduction medication. The plan includes recruiting 100 individuals suffering from moderate to severe pain to participate. One half of the group will be assigned to take the experimental drug, and the other half will be assigned a placebo. The study will be blind, so the individuals will not know which treatment

they are receiving. At the end of the study, they will be asked to record how much pain relief they experienced. Suppose the researchers are also blind. Why does it matter whether the researchers know which treatment is administered? Select the best answer (answer choices on the next page).

a) If the researchers know which treatment is the real drug and which is the placebo, they may change the treatments of participants that are healthier to try and make the results of the study look more promising than they really are.

b) If the researchers know which is the control group and which is the experimental group, they may (intentionally or unintentionally) provide extra support to one group. By performing a double-blind experiment, outside bias has a minimal effect on the study.

c) When the researchers are blind to the treatment information as well as the participants, the researchers are less likely to become as invested in the participants.

d) If the researchers do not know which is the experimental group and which is the control group, they will not know how to properly handle any medical issues that arise due to the treatment. A single-blind study is preferable and safer.

3) A social worker wants to examine methods that can be used to deter truancy. Three hundred chronically-truant students volunteer for the study. Because the social worker believes that socioeconomic class plays a role in truancy, she divides the 300 volunteers into groups according to household income. Of the 300 students, 120 fall in the low-income category, 132 fall in the middle-income category, and the remaining 48 students fall in the upper-income category. The students within each income category are randomly divided into three groups. Students in Group 1 receive no intervention. Students in Group 2 are treated with positive reinforcement; for each day a student is not truant, they receive a star that can be traded for rewards. Students in Group 3 are treated with negative reinforcement; each truancy results in a one-hour detention. However, the hours of detention are cumulative, meaning that the first truancy results in one hour of detention, the second truancy results in two hours, and so on. After a full school year, the total number of truancies are compared.

Part A: Identify the experimental units in this study.

a) The experimental units are all students.

b) The experimental units are social workers in the agency.

c) The experimental units are the chronically-truant students.

d) The experimental units are the methods used to deter truancy.

Part B: Identify the response variable.

a) The response variable is the total number of truancies.

b) The response variable is the method used to deter truancy.

c) The response variable is the success rate of the control group.

d) The response variable is the success rate of the experimental group.

Part C: Identify the treatments. Select all that apply.

a) No intervention

b) Positive reinforcement

c) Detention

d) Negative reinforcement

e) Income level

Part D: Identify the blocks in this experiment.

a) Low-income, middle-income, upper-income

b) Positive reinforcement, no reinforcement, negative reinforcement

c) Total number of truancies

d) Chronically-truant students

Part E: How is randomization used in this experiment?

a) The students within each income category are randomly assigned to the groups (no intervention, positive reinforcement, or negative reinforcement).

b) The social worker determines which students will go into the groups (no intervention, positive reinforcement, or negative reinforcement) based on their past histories.

c) Each student determines which group they will go into (no intervention, positive reinforcement, or negative reinforcement) based on preference.

d) Students are randomly assigned to low-income, middle-income, or upper-income categories.

Part F: Would it be appropriate to use the completely randomized block design for this experiment?

a) Yes, because the social worker believes that socioeconomic class plays a role in truancy. Blocks would be formed based on income level to control for this difference.

b) No, because there does not seem to be any known difference that may have an effect on the total number of truancies.

c) No, because the social worker believes that socioeconomic class plays a role in truancy. Blocks would be formed based on income level to allow this difference to vary.

d) Yes, because there does not seem to be any known difference that may have an effect on the total number of truancies.

4) Consider an experiment being designed to study the effectiveness of an experimental pain reduction medication. The plan includes recruiting 100 individuals suffering from moderate to severe pain to participate. One half of the group will be assigned to take the experimental drug, and the other half will be assigned a placebo. The study will be blind in the sense that the individuals will not know which treatment they are receiving. At the end of the study, they will be asked to record, using a standardized scale, how much pain relief they experienced.

Part A: Why is it important to use a placebo in this study?

a) A placebo is used because it is often costly to develop the experimental drugs, and it is too expensive to assign all the individuals the real drug, especially if it turns out to be ineffective. Some people are given the placebo to reduce the cost of running the trial.

b) Even though it is the same as receiving no treatment, a placebo is used because people would not participate in the experimental study if they did not receive anything.

c) Without a placebo, the individuals in the control group may decide to take other pain relief medications that could skew the results of the study. If they think they are on medication, they will not take other medications during the course of the study.

d) With a placebo, or a control group, we can differentiate between the placebo effect and the actual effect of the medicine. Using a placebo for the control group rather than having them receive no treatment also ensures that the individuals do not know what treatment they are receiving.

Part B: Of the 100 participants, 45 are male and 55 are female. During the design of the study, one member of the research team suggests that all males be given the active drug and all females be given the placebo. Another member of the team wants to randomly assign each of the total group of 100 participants to one of the two treatments. Which plan (the first researcher's or second researcher's) is the best experimental design for measuring the effectiveness

of the medication if the results of the experiment are to be generalized to the entire population, which consists of both females and males?

(Fill in the blank) The _____ researcher's is the best experimental design compared to the _____ researcher's plan.

Part C: Does the fact that the participants of the study were recruited rather than selected at random prohibit generalization of the results?

a) Recruiting participants rather than selecting at random could cause non-response bias in the study.

b) Not choosing at random could represent an issue, but the selection process is reasonable if the group under study is considered representative of the population to which the results are to be generalized.

c) Not choosing at random could present an issue, but the selection process is reasonable if all those selected are assigned to the experimental group and 100 new individuals not suffering from moderate to severe pain are selected for the placebo group.

d) Recruiting participants rather than selecting at random could cause response bias in the study.

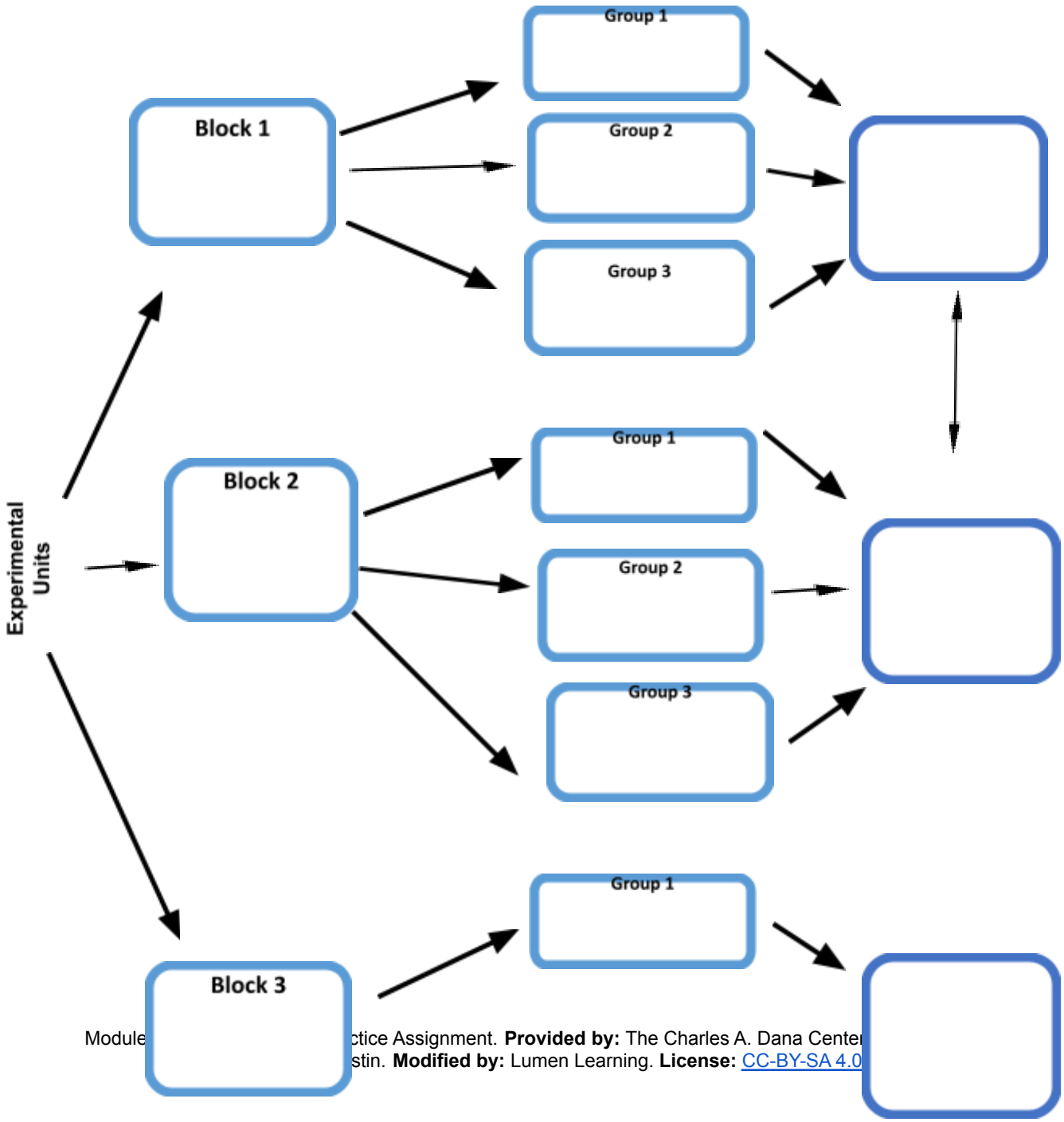
5) Would you trust the results of the study in Question 4?

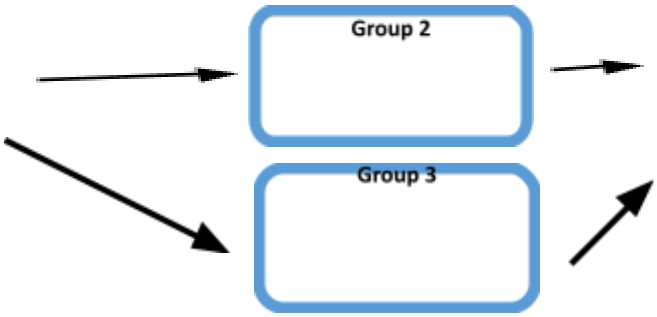
6) Recall the study in Question 3:

A social worker wants to examine methods that can be used to deter truancy. Three hundred chronically-truant students volunteer for the study. Because the social worker believes that socioeconomic class plays a role in truancy, she divides the 300 volunteers into groups according to household income. Of the 300 students, 120 fall in the low-income category, 132 fall in the middle-income category, and the remaining 48 students fall in the upper-income category. The students within each income category are randomly divided into three groups. Students in Group 1 receive no intervention. Students in Group 2 are treated with positive reinforcement; for each day a student is not truant, they receive a star that can be traded for rewards. Students in Group 3 are treated with negative reinforcement; each truancy results in a one-hour detention. However, the hours of detention are cumulative, meaning that the first truancy results in one hour of detention, the second truancy results in two hours, and so on. After a full school year, the total number of truancies are compared.

Fill in the following diagram to illustrate the design of the experiment.

[Continued on the next page.]




Group 2
Group 3