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Survey of Carnegie Mellon Faculty Regarding Attendance and Student Performance

Summary: We are interested in conducting a survey of members of the Carnegie Mellon faculty community in order to determine if there is a relationship between whether or not a class has mandatory attendance and students' performance in the class. This topic is interesting because there is a large disparity in the way classes are structured across various departments of the university, and thus it is possible for two students of different majors to have entirely opposite classroom experiences. More specifically, many humanities courses are small and discussion based, while many science and math courses are large lectures composed of students from varying technical majors. In general, it is not practical for instructors of such courses to require or take attendance because of the large number of students. This survey is interested in determining if requiring attendance has an effect on or can improve students' performance in classes.

K. Our sampling scheme involves a stratified and clustered design. We will first stratify by colleges, so each of the seven colleges of the university will be a stratum. Within each college, we will randomly sample a cluster of departments. We will choose the sample size of the sample of departments to be proportional to the number of departments within that college, so that each college is appropriately represented in the sample. Within each department, we will then stratify the courses based on their level, (ie 100, 200, 300, 400 level), and then we will randomly sample courses within each level based on the pre-survey responses from instructors who are willing to participate in the survey. From each level, we wish to sample one attendance optional and one attendance mandatory course.

Despite the complexity of this design, we have chosen it in order to account for the large variability between courses, departments, and college. Using a multi-level stratified sample with randomly sampled clusters will allow us to make the most accurate comparisons between classes, and we will ultimately be able to make large-scale inferences by looking collectively at the comparisons for all the pairs of classes at each level for all of the departments.

I am afraid this design is too complex to carry out effectively or analyze effectively in 303. Please choose one of the simpler designs I suggested in my l.3-4 feedback.

See extra page for some examples

L. Although we are surveying **faculty** about **student performance,** for this survey each observation unit is an individual **course.**

you will learn *a lot* about this set of questions by trying it out with a couple of faculty from really different colleges on campus.

You may have to put more thought into these questions!

1. College:
2. Department/Major:
3. Course Number:
4. Size of Class:
5. Attendance Mandatory or Attendance Optional?
6. Is this class lecture only? Are their recitations or labs?
7. What percentage of students enrolled attend class regularly?
8. Is this a core or major required course?
9. Class Structure: Discussion based or lecture based?
10. During what time of day does this class generally occur?
11. Campus building where class is held?
12. Duration of class period:
13. Generally offered in the fall, in the spring, or both?
14. For how many previous semesters has this course been offered?

why do these matter?

(A) you will probably only have access to info about spring classes so why bother with #13?
(B) Why does #14 matter for this survey?

15. Are notes or lectures available for students to view online?
16. How are students assessed?
    Homework Assignments?
    Exams?
    Papers/Projects?

would it be useful to list these (and a few more) and ask how much each counts in students' grades?

17. Grade distribution for a previous semester:
    Number of students receiving an A:
    Number of students receiving a B:
    Number of students receiving a C:
    Number of students receiving D/F:
    Mean Final Grade(if applicable):
18. Grade distribution for an additional previous semester:
    Number of students receiving an A:
    Number of students receiving a B:
    Number of students receiving a C:
    Number of students receiving D/F:
    Mean Final Grade(if applicable):

I'd recommend focusing on a single semester (the most recent, probably!) , and then after asking this question, ask if this is a typical grade distribution for the class.

19. Is this class usually curved?
20. If curved, how is the curve usually determined and is it the same each semester?

what does "Curved" mean? will it mean the same thing (or even be recognized) in different colleges?

M. In our comparison of performance between classes, we will consider the difference in mean final grade for attendance optional versus attendance mandatory classes.
We will wish to estimate the true difference to within a margin of error of 3 points.
As an estimate for the standard deviation associated with this difference, we will use an estimate from a previous study which compared exam performance between students with high attendance and students with low attendance. To obtain an estimate of standard deviation for our purposes, we consider the standard deviations for the exam performance of these two groups. From this study, the standard deviation in score for the high attending group was 13.1, and the standard deviation for the low attending group was 7.1. Since we will be looking at a larger sample of final grades, which we would expect to have less variation than grades for a single exam, so we will use the smaller of these standard deviations as our estimate.

To determine the sample size for each strata, we consider first the number of departments in each college. We have decided to randomly sample 50% of the departments in each college.
Strata 1 – College of Humanities and Social Sciences – 8 departments (randomly sample 4)
Strata 2 – Mellon College of Science – 4 departments (randomly sample 2)
Strata 3 – Tepper School of Business – 1 department
Strata 4 – Carnegie Institute of Technology – 5 departments (randomly sample 3)
Strata 5 – College of Fine Arts – 5 departments(randomly sample 3)
Strata 6 – School of Computer Science – 1 department

We will construct a simple random sample of departments with sample size of 14. Within each department we are estimating that we will look at 8 classes, which brings our total sample size N to 112.

Applying the finite population correction for SRS without replacement,
$n_0 \geq (1.96)^2(7.1)^2/(.05)^2 = 21.52.$
$n \geq (112*21.52)/(112+21.52) = 18.05$

calculation errors here. You are looking at a sample size more like 77,000, which is clearly infeasible.

If we estimate a response rate of about 15%, then we would want to obtain a sample of 120.

Method (A): stratify by college; and then take an SRS, w/o replacement, of classes within each college. Take as your faculty respondent whoever is teaching the classes in your sample.

Since the units are classes, if you are doing proportionate sampling within each stratum, you will need to know how many classes are being offered by each college this semester. Then follow the guidelines in the longer stratified sampling handout to determine a sample size (try the "trial and error" method for example).

Method (B): Stratify by college; then take an SRS, w/o replacement of *departments*, then take *every* instructor who is teaching an undergraduate course in that department for the current semester. [this samples departments as clusters within college strata, btu simplifies the sampling within departments]

For a rough sample size:

(1) determine how many instructors you would need for an SRS from all instructors on campus
(2) inflate this by about 20% to account for clustering effects.
(3) determine roughly the number of departments you will need by dividing your instructor sample size by the average number of instructors per department
(4) apportion departments to the colleges using proportionate sampling (so you will need the total number of departments in each college to do this)

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NOTE ON YOUR SAMPLE SIZE CALCULATION:

Your sample size calculation above was something like

n0 = Z^2 * SD^2/ME^2 = (1.96)^2*(7.1)^2/(0.05)^2 = 77,463, roughly

which is obviously too big to be feasible. The problem here is your ME. It's not reasonable to have a ME of 0.05 for something that has an SD of 7.1. So you should make your ME bigger (but so big that the CI's are useless!). You may also have to reduce to 90% CI's or something instead of 95% CI's.