Observational Study

Have two groups, (observe) how they did.

Versus: randomly assign to two groups, and check how they did.

Issues:
    Selection bias. People who eat less sugar eat less.
    Confounding. People who eat less sugar (may) weigh less.

Randomization smooths out confounding.

Others: information bias (bad measurement, missing data), . . . ,...

Useless?
Some hope:
    2014 Cochrane study of medical systematic reviews suggest similar results from RCT's and observational studies.

What is the question?

To homework or not to homework.

That is the question.

Selection bias: Yes.
Confounding: background, confidence, motivation.
    capabilities, like to study, like beer, big, little
    who knows?
Missing Data: pandemic.

Really most important: lots of variance.

Statistics don't tell you what's good for you,
    your individual behavior dominates everything.
E.g., do you "work hard" or "hardly work" in lecture.

My belief:
    Learn from notes,lectures, discussions and homework solutions
(whether assessed or not)
    Its up to you.

But ok...data: Summary.

Independent variable: grades in other courses as proxy.

Dependent Variable: Grade in CS70.

My estimate of effect size is: .1-.2 points in GPA.

Raw difference in GPA:.3 in GPA in 70.

Individual mileage will vary.

Independent Variable: 16A

Variance Reduction: 0.52

Control	mean(hw)	mean(no)	diff	count(hw)	count(no)	z-score
A+	3.91	3.94	-0.04	51	18	0.64
A	3.82	3.73	0.10	335	80	1.97
A-	3.50	3.51	-0.01	147	73	0.20
B+	3.33	3.34	-0.00	205	71	0.06
B	3.03	2.78	0.25	128	62	2.29
B-	2.52	2.62	-0.10	50	22	0.73
C+	2.53	2.16	0.37	15	9	1.02
C	2.46	1.51	0.95	8	12	2.13
C-	2.22	1.90	0.32	6	3	0.55
Incomplete	3.26	2.78	0.48	9	4	1.09
Not Pass	1.98	2.45	-0.47	12	8	0.90
Pass	3.05	2.80	0.25	253	90	2.71
Withdrawn	2.75	1.14	1.62	19	20	4.29

Average Difference: 0.09

Independent Variable: 61B

Variance Reduction:.39

Control	mean(hw)	mean(no)	diff	count(hw)	count(no)	z-score
A+	3.89	3.88	0.01	313	78.00	0.38
A	3.44	3.37	0.08	734	232.00	1.98
A-	3.22	2.95	0.26	291	96.00	2.83
B+	3.00	2.69	0.31	177	70.00	2.93
B	2.90	2.36	0.55	41	29.00	2.53
B-	2.75	2.77	-0.02	20	7.00	0.05
C+	1.75	1.63	0.12	15	9.00	0.20
C	2.31	1.55	0.76	13	6.00	1.31
C-	1.63	1.24	0.39	7	7.00	0.54
F	1.74	0.94	0.80	14	5.00	1.14
Incomplete	2.34	2.48	-0.14	14	10.00	0.33
Not Pass	1.12	1.04	0.08	17	9.00	0.18
Pass	2.90	2.57	0.33	94	41.00	1.71
Withdrawn	2.59	2.02	0.57	48	34.00	2.00

Average Diff:.15

Independent Variable: 61A

Variance Reduction: 0.38

Control	mean(hw)	mean(no)	diff	count(hw)	count(no)	z-score
A+	3.89	3.80	0.09	253	96.00	2.21
A	3.68	3.45	0.23	387	124.00	4.24
A-	3.48	3.13	0.35	327	121.00	4.59
B+	3.13	2.86	0.27	350	82.00	3.36
B	2.99	2.53	0.45	212	75.00	4.27
B-	2.32	2.33	-0.01	77	40.00	0.07
C+	1.89	1.69	0.20	23	19.00	0.54
C	2.17	2.00	0.17	4	2.00	0.41
F	2.05	1.36	0.69	16	10.00	1.18
Incomplete	2.40	3.00	-0.60	5	3.00	0.70
Not Pass	2.41	1.00	1.41	8	3.00	1.23
Pass	3.03	2.94	0.09	155	50.00	0.57
Withdrawn	2.97	2.77	0.19	41	20.00	0.58

Average Diff: .26

Independent Variable: English

Variance reduction: .06

Control	mean(hw)	mean(no)	diff	count(hw)	count(no)	z-score
A+	3.69	3.30	0.39	16	8.00	1.40
A	3.42	3.03	0.39	162	71.00	3.33
A-	2.99	3.05	-0.05	59	13.00	0.24
B+	2.99	3.08	-0.10	20	12.00	0.42
B	3.20	2.75	0.45	8	4.00	1.52
B-	2.67	2.23	0.43	3	3.00	0.69
F	2.77	2.15	0.62	3	2.00	1.47
Not Pass	4.00	1.10	2.90	2	3.00	2.64
Pass	3.22	2.87	0.36	82	33.00	1.85
Withdrawn	3.08	2.33	0.74	4	3.00	1.84

Average Diff: .27

GPA in many courses.

Independent Variable: Bucketed Gpa in Data 8, Mathematics, 61A,61B,16A,16B.

Variance Reduction:.44

Control	mean(hw)	mean(no)	diff	count(hw)	count(no)	z-score
A	3.82	3.67	0.14	592	158	3.48
A-	3.40	3.24	0.16	515	162	3.17
B+	3.10	2.97	0.13	384	115	2.14
B	2.74	2.42	0.32	136	68	2.64
B-	2.39	2.34	0.05	79	32	0.28
C+	2.17	1.86	0.32	31	23	0.91
C	2.14	2.24	-0.11	17	7	0.22
C-	1.39	1.01	0.38	8	9	0.84
D	1.60	0.57	1.03	4	4	1.26
F	0.75	1.77	-1.02	4	3	0.86

Average Diff: 0.15

Your choice.

Really this is your choice.

Your behavior is what matters way more than "average" behavior.

  A+ student: The homework made me really understand and grow. But I did everything..
  A+ student: I didn't do anything all semester.
    The last week I watched your lectures, read the slides, and read the notes and did some midterms.
  A+ student: I read the notes, until I could reproduce the proofs.
  A+ student: I did the old midterms.
  Double Major in Haas: Material in 170 may be harder, but after 70 it was fine.
        CS is more challenging than business courses.

Confidence and Motivation.

My observation on successful students: It's Confidence and Motivation.
  Confidence: 'I don't understand this. But I can. So let me focus.'
  Not confident: 'I don't understand. Let me not focus on that and pretend to understand.'
  Motivation: I love this stuff and/or I need to get a good grade.
  Motivation: I want to grow in power.
  Motivation: It comes with effort and understanding: 'the Eureka moment.'