Supplemental Material

Strategic Resource Use for Learning: A Self-administered Intervention that Guides
Self-Reflection on Effective Resource Use Enhances Academic Performance

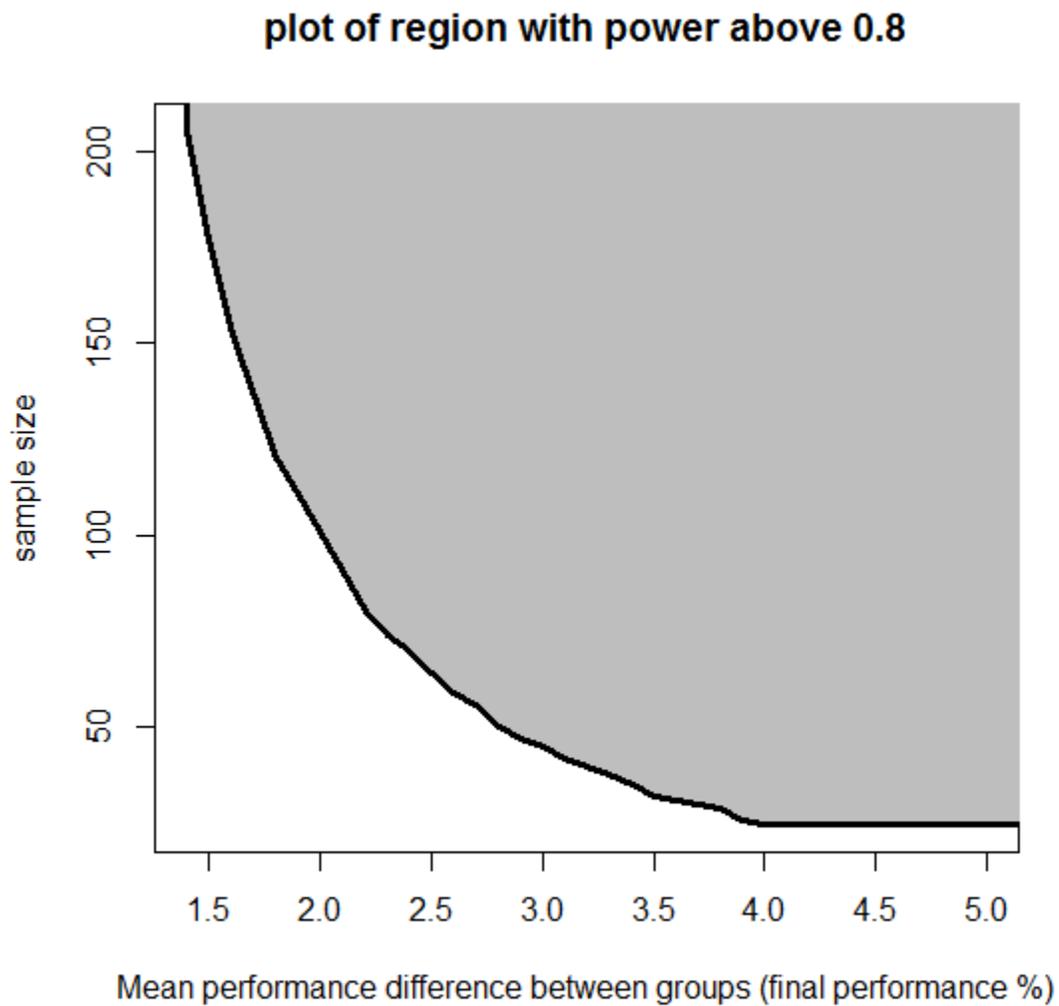Patricia Chen, Omar Chavez, Desmond C. Ong, & Brenda Gunderson

Power Analysis

Figure S1. Power analysis graph of sample size needed to detect different effect sizes at α
= 0.05 and power = 0.8. Standard deviations were estimated from previous cohorts of
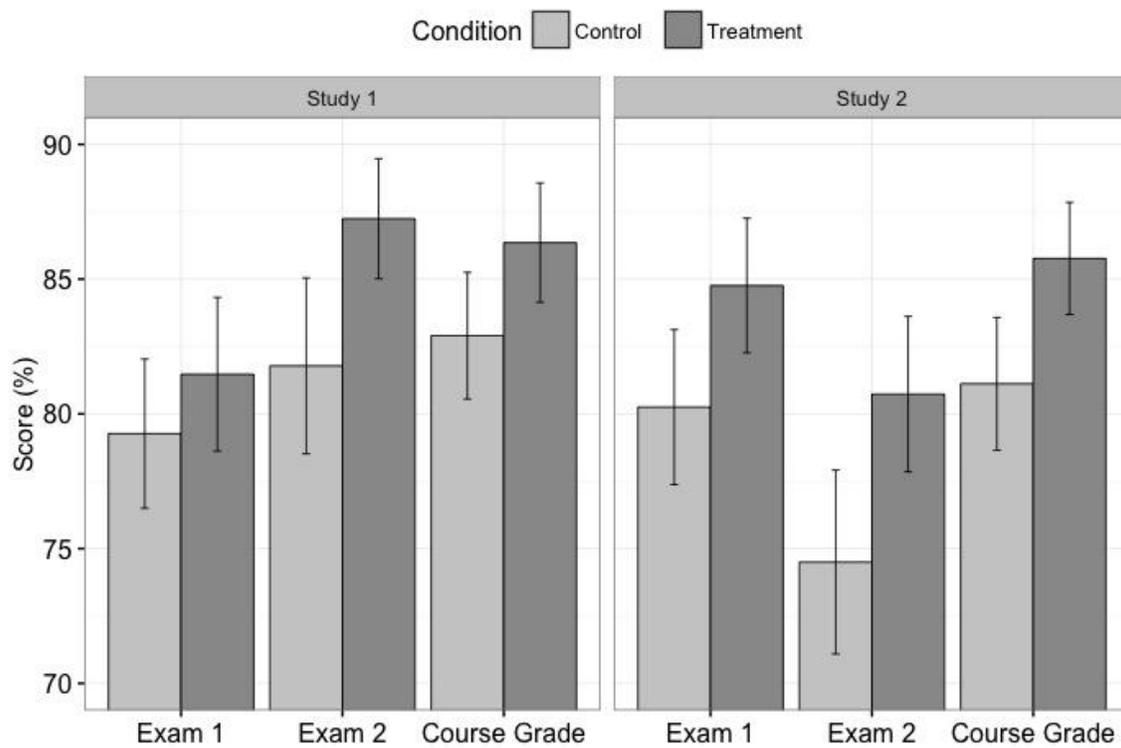students in the class.

Fig. S1. Average student performance (% score) by condition on Exam 1, Exam 2, and the final course grade. This graph only includes students who took the full intervention in comparison to those who received the control exam reminder before both of their exams. Error bars represent 95% confidence intervals of the means for each condition.

Table S1

Percentage of students in the class who participated in each survey.

% Participation	Study 1	Study 2
Pre-Exam 1 Survey	78.7	84.5
Pre-Exam 2 Survey	90.4	76.3
Both Pre-Exam Surveys	73.0	69.1
Post-Exam 1 Survey	80.9	78.3
Post-Exam 2 Survey	78.1	83.6
Both Post-Exam Surveys	68.0	71.0
All Four Surveys	58.4	58.9

Note. There were 178 students who enrolled in and obtained a final grade in the class in study 1 and 203 students in study 2.

Table S2

Descriptive statistics (mean, standard deviation, and 95% confidence interval around the mean) of students' pre-intervention measures by condition.

	High School GPA	College GPA	Goal grade	Motivation	Importance	Confidence
Study 1						
Control	3.80 (0.33)	3.08 (0.43)				
	[3.72, 3.88]	[2.98, 3.18]				
Treatment	3.80 (0.39)	3.13 (0.54)				
	[3.70, 3.90]	[3.01, 3.24]				
Study 1 Exam 1						
Control			2.39 (1.19)	5.74 (1.20)	5.88 (1.42)	4.57 (1.30)
			[2.11, 2.68]	[5.45, 6.03]	[5.53, 6.22]	[4.26, 4.89]
Treatment			2.18 (1.22)	5.87 (0.90)	6.14 (0.89)	4.86 (1.06)
			[1.89, 2.47]	[5.66, 6.08]	[5.93, 6.35]	[4.61, 5.11]
Study 1 Exam 2						
Control			2.90 (1.62)	5.98 (0.97)	6.12 (1.00)	4.63 (1.13)
			[2.54, 3.26]	[5.76, 6.20]	[5.89, 6.34]	[4.38, 4.89]
Treatment			2.56 (1.41)	6.00 (1.16)	6.23 (0.91)	4.89 (1.18)
			[2.25, 2.87]	[5.75, 6.26]	[6.03, 6.43]	[4.63, 5.15]
Study 2						
Control	3.75 (0.33)	3.19 (0.49)				
	[3.68, 3.81]	[3.09, 3.30]				
Treatment	3.79 (0.31)	3.24 (0.50)				
	[3.72, 3.85]	[3.13, 3.34]				
Study 2 Exam 1						
Control			2.36 (1.45)	5.84 (1.21)	6.17 (0.99)	4.83 (1.13)
			[2.05, 2.67]	[5.58, 6.10]	[5.96, 6.38]	[4.59, 5.07]
Treatment			2.16 (1.34)	5.87 (1.03)	6.07 (1.03)	4.72 (1.04)
			[1.88, 2.45]	[5.65, 6.09]	[5.85, 6.29]	[4.50, 4.94]
Study 2 Exam 2						
Control			2.63 (1.43)	6.28 (0.99)	6.29 (0.90)	5.00 (1.22)
			[2.31, 2.94]	[6.06, 6.49]	[6.09, 6.49]	[4.73, 5.27]
Treatment			2.36 (1.73)	6.12 (0.92)	6.21 (0.90)	4.77 (1.28)
			[1.96, 2.76]	[5.89, 6.32]	[6.01, 6.42]	[4.48, 5.07]

Note. Students' motivation, importance, and confidence measures were assessed using 7-point scales. No significant differences between conditions were found on any of these pre-intervention measures.

Table S3

Goodness-of-fit statistics for mediation models tested.

Model	χ^2(df)	*p*-value	RMSEA	CFI	SRMR	Indirect effect 95%CI
Predicted Model	1.02 (2)	.601	0.000	1.000	0.020	[0.02, 0.69]
Alternative Models Tested						
Saturated model	0.00 (0)	-	-	-	-	[-0.20, 1.64]
Serial mediation model with predictors in opposite order	8.50 (2)	.014	0.095	0.760	0.056	[-0.03, 0.35]
Parallel mediation model	9.40 (1)	.002	0.153	0.690	0.074	[-0.16, 1.69]
Single Mediator Models						
Self-reflections about learning	0.00 (0)	-	-	-	-	[0.001, 1.65]
Rated resource use effectiveness	0.00 (0)	-	-	-	-	[-0.19, 0.89]

Note. There are no goodness-of-fit statistics estimated for any of the saturated models, including the two single mediator models. The single mediator models only test the indirect effect of one mediator variable specified at a time.

Appendix S1

Class Resource Checklist

Strategic Resource Use for Learning Checklist

Please select the Stats 250 resources that you think will help you prepare for Exam 2 effectively.

- ☐ Lecture notes
- ☐ Video captured lectures (Blue Review)
- ☐ Past required HW problems
- ☐ Past recommended HW problems
- ☐ Practice exam questions (from lab workbook)
- ☐ Past exam questions through Problem Roulette
- ☐ Name That Scenario Applet
- ☐ Lab materials (ILPs)
- ☐ Textbook readings
- ☐ Yellow formula card
- ☐ Discussions with other students in the class (e.g. study group)
- ☐ Office hours held by a lecture instructor
- ☐ Office hours held by GSIs
- ☐ Asking questions in class
- ☐ Private tutoring

Appendix S2

Self-Reflection on Learning Scale

Different students have different approaches to the same class. We are interested in how you personally approached this Stats 250 class.

Please tell us how often you engaged in the following behaviors in this class.

Never	Rarely	Sometimes	Often	Most of the time
1	2	3	4	5
○	○	○	○	○

1. On each assignment I was given, I carefully considered what the instructor expected of me as a student.
2. I actively tried to find out what was expected of me to get good grades in this class.
3. As I studied for the class, I kept monitoring whether or not the way I was studying was effective.
4. I actively evaluated how well certain study techniques were working for me in this class.
5. When I was stuck on a problem, I changed my approach rather than continuing to work on it the same way.
6. Whenever I got stuck on a problem, it was easy for me to switch to a different way of thinking about the problem.
7. I tried to understand the reasons behind any difficulty I had in class.
8. After each exam, I thought about how my performance in class was a result of how I had been doing things.

Appendix S3

Example Excerpts from "Why Useful" Open-Ended Responses and Students' Plans

Why Useful Excerpts

Student A: Lecture notes, past HW problems, practice exam questions: these will be helpful for me because I can see the steps necessary for completing a problem and I can practice doing the problems with a guide (my lecture notes) and follow the steps on those until I can do them without using my lecture notes / Yellow formula card: I need to become more familiar with the card so I know where certain equations are when I get to the test I know what equations I need for each type of problem / Discussions, private tutoring: These will help me to verbally talk through my problems so that I can make sure I know what I am talking about when I do the problems on my own

Student B: Reviewing lecture notes and blue review for days I missed will help to solidify the concepts and how to apply equations to problems, using the examples given for each specific type of problem for further understanding. Past homework problems as well as problem roulette and lab workbook problems and practice exam questions will prepare me for all types of problems that could be asked on the exam and help me become familiar with the format of the exam and review by repetition of the concepts in many examples. [Name that Scenario] does the same thing. Discussions with classmates helps collaboration over concepts not understood even after doing practice problems. Explaining things out loud to other people had [been] proven to be the best way to retain information and a great way to study.

Exam Preparation Plans

Student C: sunday 5/25 - home: relistening to lectures I had trouble with and looking over lecture notes / monday 5/26- home: look over old homework and listen to more lectures, start HW 3 / tuesday 5/27- library: finish HW 3 and do problem roulette / wednesday 2/28- look over past exams and look over concepts

Student D: -Over the weekend, 6/13-6/15, I plan to review lecture notes and complete HW5 at home. / -On Monday, 6/16, I will practice recommended HW questions and past exam questions at the library. / -On Tuesday, 6/17, I will review the yellow formula card and practice past exam questions for topics that I am least familiar with at home.

Appendix S4

Example of Students' Weekly "Get Things Done" List

Stats 250 GTD (=Get Things Done) List for June 7 to 13

… A weekly checklist for Stats 250

☐ 1. **Watch the 1 video for Prelab Lesson 7** at **http://tinyurl.com/statsprelabs**, **complete Assignment 7** and submit answers directly inline to your Ctools site assignment – before **lab Mon, June 9.** This prelab is about comparing two means that we covered in lecture Thu, June 5.

☐ 2. **Review your Gradebook:** Check to be sure all entries are up to date and correct. If any issues or questions, contact your GSI by Wed June 11.

☐ 3. **Review your Exam 1:** Solutions are posted. Ask your questions by Wed, June 11.

☐ 4. Work on **required HW4** questions (**lecturebook.com**) – entered answers automatically submitted on **Wed, June 11 at 8 AM**. For Q5 you use SPSS to analyze a sample of gas prices from 20 local gas stations.

☐ 5. Stuck on a HW 4 question? Want some more practice? Try the ***MANY* recommended HW 4** questions through your online HW tool (**lecturebook.com**)—**anytime**. Solutions are provided.

☐ 6. **Watch the videos for Prelab Lesson 8** at **http://tinyurl.com/statsprelabs** and **complete Assignment 8** then submit answers directly inline to your Ctools site assignment before **lab Wed, June 11.** This prelab is about comparing many means (ANOVA) that we will finish in lecture Mon, June 9.

☐ 7. **Study for Quiz 2:** focus on HW 4 material (one mean, mean difference, difference between two means). A list of questions from old Exams (from lab workbook) is posted on ctools (under Review info). You can also try **Problem Roulette** topics 7, 8, 9; and try the **Name That Scenario (NTS).**
Quiz 2 is Thu, June 12, starting promptly at 9:10 am in MLB AUD 4 for labs 3 (Kit), 4 (Daniel), 6 (Julie), 7 (Kit), and 8 (Sean) and in MLB Lecture Room 1 for labs 2 (Tony) and 5 (Doug); after the quiz, lecture will continue in MLB AUD 4 at 9:45 AM.

☐ 8. Reviewing notes, working on HW, preparing for the quiz and have a question? Stop by **office hours** for June 9-11: **M 11–12 in 445A WH and 1–4 in SLC, Tu 10–12 in 445A and 1–7 in SLC, W 11–3 in SLC.**

☐ 9. **Looking Ahead:** HW 5 (the last required HW) will open Mon, June 9 at 8 am and close Tue, June 17 at 8 am. Exam 2 is Wed, June 18 from 9:15 to 10:45 am in **MLB AUD 4 and MLB Lecture Room 1**.

☐ 10. Check out this list of how **researchers claimed a form of significance** when the results failed to reach significance at the 0.05 level ~ **http://mchankins.wordpress.com/2013/04/21/still-not-significant-2/** shared by GSI Daniel.